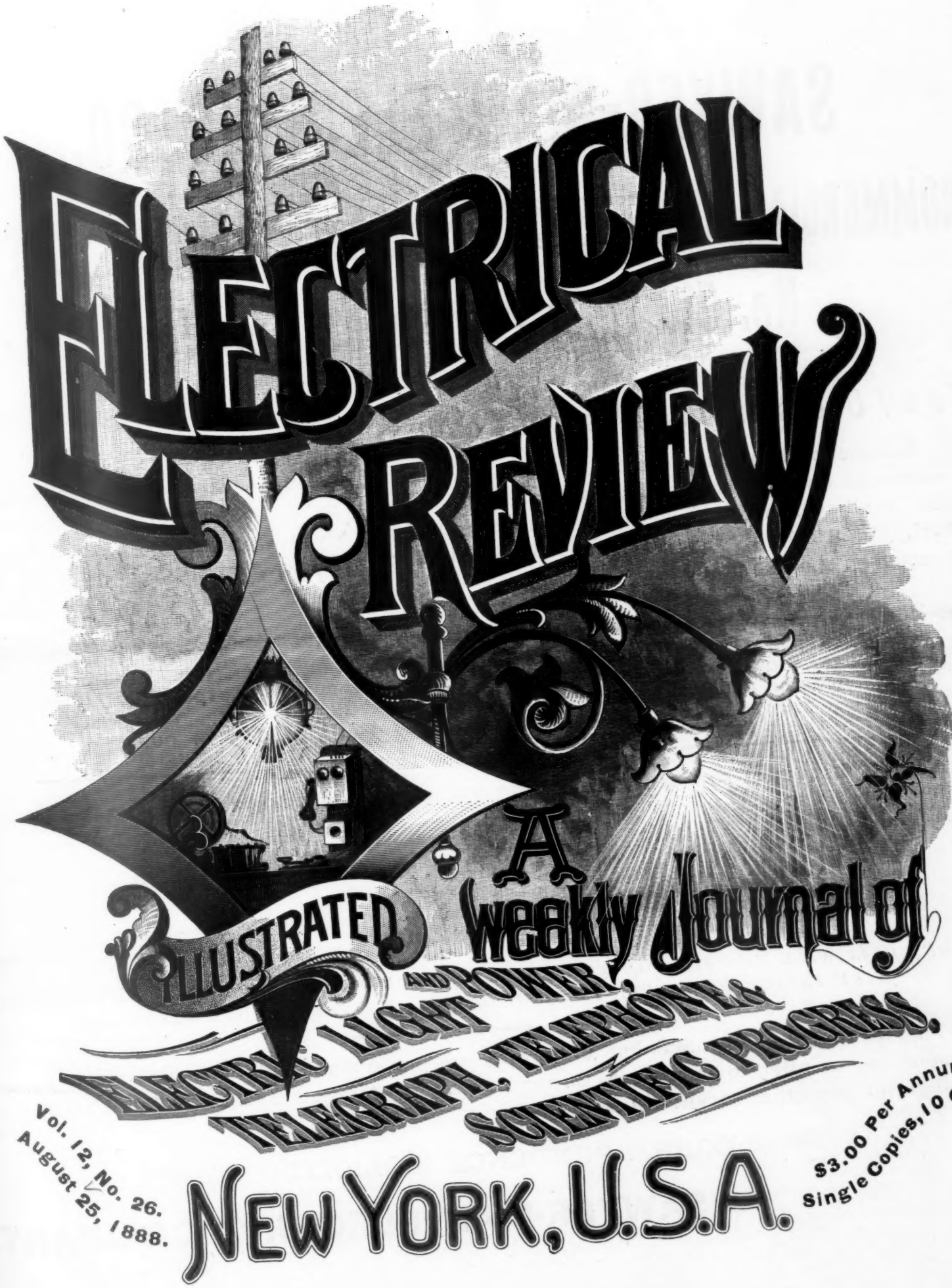

Vol. 12, No. 26.
August 25, 1888.

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Single Copies, 10 Cts.

SAWYER-MAN ELECTRIC CO.,

COMMERCIAL AGENT OF THE CONSOLIDATED ELECTRIC LIGHT CO.

No. 510 West 23d Street, New York,

August 1st, 1888.

To all Users of Incandescent Lamps:

Experience has demonstrated that the life and utility of the Incandescent Electric Lamp is increased and the cost of its manufacture diminished by a decrease of the electromotive force. We have, therefore, decided to divide our commercial lamps into three classes, viz: HIGH, MEDIUM, AND LOW VOLTAGE LAMPS; of which classes, 100, 75, and 50 volts, respectively, shall stand as the types.

THIS COMPANY, THE FIRST TO GIVE TO THE CONSUMER THE BENEFIT OF SUCH CLASSIFICATION, IS ENABLED, BY REASON OF INCREASED MANUFACTURING FACILITIES, AFFORDED BY THE ENLARGEMENT OF OUR NEW YORK AND PITTSBURGH FACTORIES, AND BY REASON OF VALUABLE IMPROVEMENTS MADE IN THE LAMP, TO OFFER THE FOLLOWING REDUCTION IN PRICES FOR LAMPS WITH OUR

STANDARD BASES

SUBJECT TO DISCOUNTS FOR CENTRAL STATION USE AND TO PURCHASERS OF ORIGINAL PACKAGES OF 250 EACH.

C. P.	50 Volt.	75 Volt.	100 Volt.
16, and under,	$0.70	$0.75	$0.80
20,	.75	.80	.85
24,	.80	.85	.90
32,	.90	.95	1.00

THREE CENTS WILL BE PAID FOR THE RETURN OF EVERY LAMP BASE WITH THE PLATINUM WIRE INTACT, DELIVERED IN GOOD ORDER AT EITHER OF OUR FACTORIES.

For the purpose of obtaining uniformity of production, and of reducing the cost of manufacture, we offer to purchasers of our lamps our Standard Sockets, without charge, in exchange for any other socket in use by them.

CORRESPONDENCE SOLICITED.

SAWYER-MAN ELECTRIC COMPANY.

ELECTRICAL REVIEW

ILLUSTRATED.

A WEEKLY JOURNAL OF

Electric Light, Power, Telephone, Telegraph and Scientific Progress.

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Buckingham and Lemp's Automatic Brush Adjuster for Dynamos.

The above named individuals have just patented a very ingenious means for automatically keeping the brushes at the point of least spark on the commutator. The lines of force due to the field magnets tend to go straight through the armature, and induce poles directly opposite the fixed magnet poles. The current in the armature tends to produce poles at right angles to these induced poles; and a resultant field is the consequence, which is intermediate between the said positions. Obviously, the position of this resultant field controls the position of least spark for the brushes. But the resultant field constantly varies according to the current in the armature, and the relative strength of the magnetic poles of the armature and field magnets. The resultant field therefore lags or advances during the operation of the dynamo according to the character of change in the electric load, *i. e.*, the external resistance of the circuit.

The patentees take advantage of this fact to cause a corresponding shifting of the brush position. They describe the illustrated form of their invention as follows:

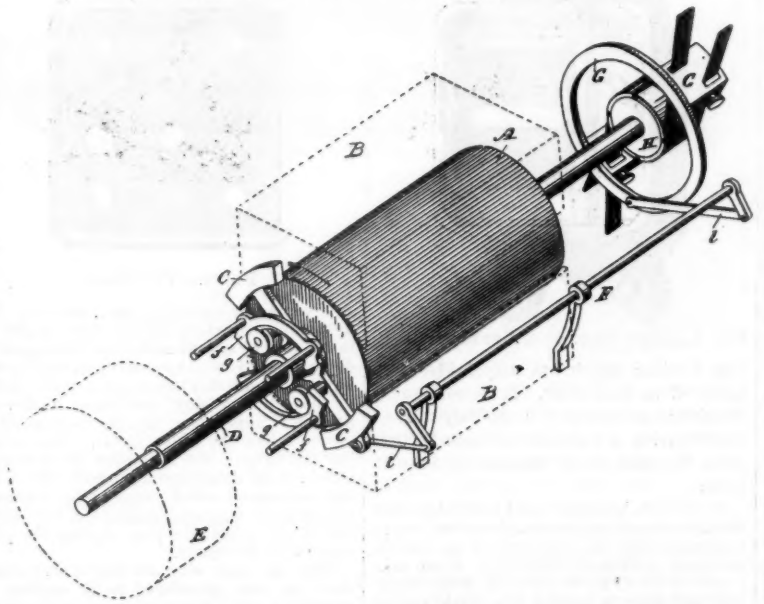
"*A* represents the armature of a dynamo upon a shaft, *D*, with a drive-pulley, *E*, for rotating the same. The pole-pieces of the field-of-force magnets are shown in dotted lines. At one end of the armature, and loosely about the shaft, *D*, is arranged a magnetic bar, *C*, upon a sleeve surrounding said shaft, and having pole-shoes at its end. This magnetic bar is free to turn in either direction, and has connected with it a connecting-rod, *l*, rigidly affixed to a rock-shaft, *F*, which is suitably supported, and has at its other end another rod, *l*, connected with a ring, *G*, or other means, which sustain the commutator-brushes of the commutator, *H*. In order to eliminate the friction between the rotating shaft, *D*, and the sleeve upon which the magnetic bar is mounted, so as to place the latter entirely under the influence of the magnetic forces, we provide sectors, *f*, suitably supported by rods extending therefrom, the sectors supporting guide-wheels, *g g*, journaled upon extensions from the magnetic bar. These devices are made of non-magnetic material, so as not to interfere with the operation of the apparatus. It will be observed that by the construction shown the bar, *C*, is supported entirely by the means described, and the rotation of the armature will not affect the bar."

The bar, *C*, is therefore suspended in the resultant field and is influenced by it alone. As this resultant field shifts according to the changes in external resistance, etc., the bar, *C*, is carried with it, backwards or forwards, and the brushes are constantly adjusted to the position of least spark and highest efficiency.

The *Evening Sun*, in mentioning electric railway matters, says: "Another system known as the Bentley-Knight, has also got a road in Pittsburgh and so far it has successfully hauled large car loads up the steep grades. This last-named system is controlled by two young New Yorkers. One, George Renault, is a nephew of the Delmonicos, and his ancestors gave their name to the famous brand of cognac; the other is R. W. Blackwell, whose ancestors gave their name to the famous or rather infamous island in the East River."

The Arc Light in Politics.

One of the worst abuses of a good thing which has come under our notice for a long time, was the placing of an arc light directly under the balcony from which Mr. Blaine addressed the Republicans of Boston, Monday evening. There are a number of arc lights about the Vendome Hotel, and its white marble front and the sea of upturned faces of the crowd of seven or eight thousand enthusiasts, standing ankle deep in mud, and patiently awaiting the appearance of the great man—were brilliantly illuminated. Over the Commonwealth Avenue entrance was an arc light, with a transparent globe, which burned as though the success of the whole occasion rested on its efforts. Its hood cast a black shadow over the little balcony immediately above it, from which the orators of the evening were to speak. The Committee of Arrangements came out and looked at the light and then retired for private consultation. Thirty-five minutes later, during which time the crowd howled incessantly for the extinguishment of the arc light, the Committee again appeared and each member seemed to be urging the others to climb up and turn it off. No one was found, however, courageous enough to do this, so the Committee again retired, and after a while appeared with two ordinary kerosene lanterns, which they held up as rivals to the arc lamp, but which in reality only made the darkness more visible. Then amid the huzz as of the assembled thousands, the great man emerged from a brilliantly illuminated window and stood in inky darkness on the balcony, the arc lamp directly in front of him, and about on a leval with his feet. At this juncture the arc lamp on the band stand across the way, promptly went out, leaving the musicians to struggle with "See the Conquering Hero Comes," in the dark. To look at Mr. Blaine was to look at a naked arc light, and most of the assembly preferred to look the other way, and listen to the oratory which came from the darkness. We have heard it said by several well informed persons that this one arc light has done more to prejudice the Boston public against arc lighting, than anything which has happened in this city for a long time.—*Modern Light and Heat, Boston.*



AUTOMATIC BRUSH REGULATOR FOR DYNAMOS.

OUR LONDON LETTER.

(Special Correspondence.)

NEW CENTRAL STATIONS.

This week has seen the launching of two new companies for the supply of electricity in London from central stations.

The Chelsea Electricity Supply Co. is to begin business with a nominal capital of £100,500, of which £32,000 will now be subscribed for. It is really the joint production of the Brush Corporation, the Storage Co., and Callender's Bitumen Co.; the first of whom makes dynamos and lamps, the second storage batteries, and the third underground cables. The electricity generated at the central station will be conveyed by underground mains to sub-centers where accumulators will be charged. From these storage stations the current will be distributed to the surrounding buildings.

If electric lighting from a central station on the storage system can succeed in England at all, it ought to succeed now. The conditions are as favorable as any it is possible to conceive. The district to be lighted is that centering round Cadogan Place, and is occupied by high class dwelling houses.

The "committee of consultation" are Mr. Callender, who is also manager of the company of that name, Mr. King, engineer of the Storage Co., and Mr. I. S. Raworth, engineer of the Brush corporation. Advised by practical men like these, the company ought to do well.

The other new undertaking is the Metropolitan Electric Supply Company. The directorate boasts the name of Sir John Pender, of Mr. I. E. H. Gordon, well known in connection with the Paddington central station, and of Mr. B. Verity. The company will take over the business of the Whitehall Company, who have contracts for running 5,000 lamps. The district chosen is not less favorable, that of the Chelsea Company, and includes most of the theaters and clubs. No particular system will be adhered to, but several separate stations will be started, each on the system which may be found most suitable for its particular case.

DENSITY TESTER FOR ACCUMULATORS.

Mr. I. Hicks has just brought out a simple form of hydrometer for the use of workmen employed on accumulators. It consists of a glass tube about half an inch in diameter, closed at the bottom, but with several small holes at the sides to admit the liquid. In the tube are four small bulbs, colored green, violet, blue and red. The top or green bulb floats when the s. g. of the liquid is 1.150, and the others at 1.170, 1.190 and 1.200, respectively. A laborer who might not possess sufficient intelligence to read off the scale of an ordinary hydrometer, would find no difficulty if he was told, for instance, to mix his acid just strong enough to float the green and violet bulbs, but to leave the other two at the bottom. The densities at which the other bulbs float are marked on the tube.

A THEATER LIT BY ELECTRICITY.

The Edison Swan Company has just finished the lighting of the Adelphi Theater in London. The engines and dynamos are placed underground, near but not under the theater. The auditorium is lit by eight 200 candle-power Swan lamps, which hang from the top of the dome, and there are three-light brackets all round the galleries.

About the stage extraordinary precautions have been taken to prevent short circuits, many of the leads being run in casing lined with sheet iron, and stuffed with asbestos. The proprietors of this theatre also own the Strand Restaurant and the Adelaide Gallery, and intend to supply current for lighting them from this station as soon as the plant is complete.

UNITED TELEPHONE COMPANY.

It is announced that some of the West End exchanges of the London Telephone Company are to be kept open all night, and on Sundays. The ever watchful *Financial News* seizes the opportunity to jump on the managers of the company, stating that there is no other exchange of any importance in the whole world which is not open all night to every subscriber. What an exchange "of any importance" is, it might be difficult to define; but however true this be, the conditions in other towns are often quite different to those in London, where, owing probably to the high rate, almost all the instruments are in offices and shops, and not in private houses. The *Financial News* seems to expect the managers of the company to act on philanthropic principles rather than for the benefit of the shareholders, and to keep a large staff on duty for the benefit of a few subscribers of nocturnal habits.

CURED BY LIGHTNING.

A collier of Wolverhampton had met with an accident which made him blind. It is stated that the blindness was caused, not by any mechanical injury to the eye itself, but by the thickening of the albumen owing to a general shock to the system. Last week he was knocked down by a flash of lightning. He has since been able to see perfectly.

London, August 4. G. H. O.

Protection from Lightning.

The present season of thunderstorms brings the question of protection from lightning into special prominence, remarks London *Engineering*. It is a matter in which every one is interested, for the electric fluid is no respecter of persons, and strikes both at the hut and the palace, while it does not always spare the lonely wayfarer plodding along the road far from buildings of all kinds. It is, however, high and isolated edifices that suffer from it most; churches, factories, farmhouses and country mansions, are specially liable to its attacks. There are, however, now very few of these not furnished with conductors which are presumed to afford complete protection. Usually they do, but still it is by no means uncommon to hear of the lightning leaving a stout conductor to play vagaries within the building, springing hither and thither, and leaving most unpleasant footmarks wherever it alights. Until very recently it was customary to assume that the lightning conductor was in fault when such an unexpected result was realized. Either the joints were bad or the "earth" was deficient. Among rods of early date the latter was very often true, for they sometimes penetrated but a very short distance into the soil or ended in a stratum which became perfectly dry during the hot months of summer. But when every allowance has been made for such imperfections in construction and erection, there still remains many cases of failure which are not easy to explain without recourse to researches which have been made public during the last few years, and which tend to weaken our faith in the theories regarding protection from lightning which were current only a very short time ago. When electric self-induction began to be studied by practical men, it was seen that it must have a great bearing on the conditions under which a flash of lightning can pass along a conductor. The question of a more or less perfect earth loses much of its importance in the face of a counter electromotive force of thousands of volts suddenly generated in the rod, and opposing the quiet passage of the lightning. It only lasts the minutest fraction of a second, but then lightning cannot brook any delay, and it will strike out from the rod in gushes at any place where a neighboring conductor offers it an alternative path, often traversing a foot or two of air, or piercing a brick wall in its attempt to escape. For purposes of analogy we may compare the effect of self-induction to that of inertia, to which it bears a great similarity. The rod is full of quiescent electricity, when suddenly the lightning starts from the clouds, and with one mad spring through half a mile of sky, it enters the conductor, seeking to rush through it to the ground. But to do this it must set in motion the electricity with which the rod is already filled. The effect is like a piston coming down on a mass of water in a steam cylinder; an enormous pressure is set up, and the fluid seeks every avenue of escape, spurting through joints and stuffing-box, and sometimes carrying the solid iron of the cylinder cover with it. In the same way the electricity will often dart out from the rod, even though the lower end may make most excellent contact with the soil. The self-induction in the conductor is too great to permit of the electro-motive force of the discharge falling immediately to a safe limit; it is, no doubt, immensely decreased, for after a flash has traversed half a mile of sky a few feet of air is but a small matter.

The difficulty of getting an electric discharge to traverse a metallic conductor has been demonstrated by Dr. Oliver Lodge, in a very simple but convincing manner. He takes two Leyden jars and connects their inner coats respectively to the two terminals of a Voss machine. Between the outer coats there are practically three paths along which electricity can travel, namely, the table on which they stand, an adjustable air gap between a pair of discharging balls, and an insulated wire. The table forms an imperfect conductor between the jars and the ground, while the insulated wire guarantees that the jars shall remain at the same potential. There are also a pair of adjustable discharging rods between the terminals of the machine. Now, when the machine is worked the electricity accumulates in the jars, and while it is doing so the outer coatings remain at the same potential, there being no current in the wire connecting them, and no tendency to spark at the air gap. The tension in the jars, however, rises until it is able to leap across the space between the terminals of the machine, whereupon there is an instant rush of electricity between the outer coatings. There is practically no path for it along the table, and hence, it must go along the conductor, or across the air gap, or by both paths. Now as the resistance of air is millions of times greater than that of metal, we might, at first sight, assume that there could be no spark between the terminals. But Dr. Lodge shows that when the conductor consists of 40 feet of No. 1 (B.W.G.) copper wire, the discharge will as easily leap across a space of 14.3 tenths of an inch as take the easy path open to it. The effect of the self-induction is to raise the natural resistance of the wire from .025 ohms to something which is comparable with 1½ inches of air. If the copper wire be replaced by a similar length of thin iron wire (No. 27) having a resistance of 33.3 ohms, a still more unexpected result is obtained. The resistance of the metallic circuit is now 1,300 times as great as before, but instead of the discharge being able to

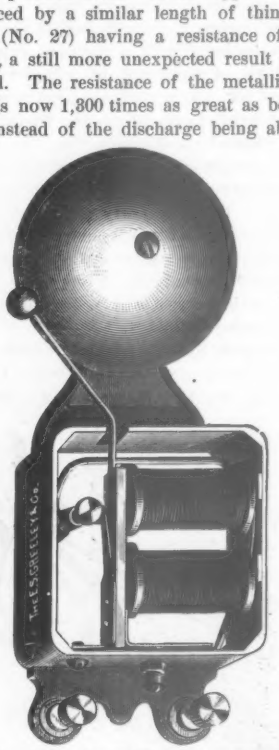


FIG. 1.—NEW IRON BOX GREELEY BELL.

leap a wider gap, it can only bridge 10.3 tenths of an inch of air. If the continuous circuit be made through a capillary tube of liquid having a resistance of some 300,000 ohms, the spark length increases to 16 or 17 tenths.

We do not, however, need to employ even the very simple apparatus described above to demonstrate the tendency of an electric discharge to flash out sideways. If we take a yard of the thinnest platinum wire obtainable, and place it parallel to a thick, copper rod, the ends of the wire being bent towards the rod until they approach it within a sixteenth of an inch, then, when the discharge from a Leyden jar is sent through the rod, it will be found that a part will leave it for the attenuated parallel path, leaping the air gap to reach it. The publication of Dr. Lodge's experiments has drawn attention to certain researches upon lightning discharges for protecting telegraph instruments, carried out in 1864 by Professors Hughes and Guillemin. The results of the earlier trials are in substantial agreement with those of the later ones, except as regards the superiority of iron over copper as a conductor. It was found that no discharge would protect the coils of the instrument if a very powerful discharge from a large battery of Leyden jars was sent through it, and that if the discharger were replaced by a copper rod of one centimeter in diameter, sufficient electricity passed by way of the instruments to burn a fine iron wire. When, however, the wire was replaced by a flat plate, even of tinfoil, a very large measure of protection was obtained. We thus see that ordinary measurements of resistance applied to lightning conductors may be very misleading if other conditions are not taken into consideration.

When the existence and the effects of self-induction are appreciated, it is easy to point out the means to minimize the latter. Clerk Maxwell showed that "the electro-motive force arising from the induction of a current on itself, is different in different parts of the section of the wire, being in general a function of the distance from the axis of the wire as well as time." Professor Hughes has also experimentally investigated the comparative effect of disposing the metal of a conductor in different ways. He found that self-induction is reduced 80 per cent. in iron and 35 per cent. in copper, by using the metal in the form of a flat strip or ribbon instead of in a cylindrical wire, and that if the ribbon were divided longitudinally into bands, and these were placed a little distance apart, the self-induction was still further reduced. He therefore recommended the use of copper strips for lightning rods. Dr. Lodge has also pursued the same line of investigations, using, however, the discharge from a Leyden jar, as more nearly resembling lightning than the interrupted currents of Professor Hughes. He proved, using the apparatus referred to above, that if a copper wire of given weight and length were employed to connect the jars, then, when the air gap measured 8.36 millimeters, the discharge would sometimes take place by the

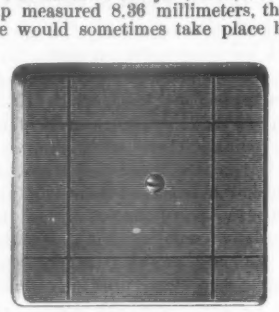


FIG. 3.—THE COVER.

wire and sometimes through the air. If a ribbon conductor of the same weight and length were substituted for the wire, then the air gap must be reduced to 6.25 millimeters before the same conditions were attained, thus showing that the ribbon presented an easier path for the discharge than the wire, although the metallic resistance of the two was equal. Dr. Lodge's experiments also seem to show that iron is quite

FIG. 2.—THE BASE.

as advantageous as copper as a material for lightning conductors, and he goes as far as to say that he considers the use of copper as doomed. It is well known that iron has far more self-induction than copper when tested in the ordinary way, and hence it offers a greater "impedence" to the passage of a current than the other metal. But when the discharge from a Leyden jar is substituted for the interrupted current, then a result is obtained which suggests the explanation that the magnetic qualities of iron have not time to come into play during the passage of the discharge.

Now, in what way are the experimental data we have mentioned to be applied in practice? Shall we abandon our accustomed plan of seeing that the joints of the conductor are well and securely made, and cease to care whether the "earth" offers a great resistance or not? He would be a bold man, we think, who would venture to do this. The utility of the old plan has been proved in so many thousands of instances that it would be most foolish to abandon it on the strength of laboratory experiments. A Leyden jar is not a thunder cloud, and it is quite possible that its discharge does not exactly simulate the effects of lightning. But it would be equally unwise to neglect the latest teaching of science, for although lightning conductors generally serve the purpose for which they are designed, there is still a long list of unexplained failures which disturbs our faith in their efficiency. The safe course seems to be to graft the new principles on the old practice. Let us abandon the old cylindrical rod for the flat tape, or, better still, for a number of tapes or small wires led down different parts of the building, so that they may be beyond the sphere of each other's influence. Another point of importance is to provide plenty of electrostatic capacity for the reception of the flash, and thus to keep the electric tension moderate. Professors Hughes and Guillemin found that if they substituted a large condenser for their lightning discharger the result was far better. A splendid example of the protective power of an extensive metallic surface came to light in 1873, when the conductors of St. Paul's Cathedral were overhauled. It was found that the original conductors, which had been erected for the protection of the dome, had been cut through in the course of some alterations, and partly removed. The lead covering was absolutely insulated from the ground, and had been, for some years. During that time, it is certain that it must have been the recipient of many lightning flashes, yet it had never suffered any injury. It had taken them all in like the coating of a Leyden jar receives the output of a machine, and had held them until they leaked away down the wetted stonework, and thus gradually got away to earth. Unfortunately, leaden roofs are not very common in modern buildings, but where they exist they should be connected to the conductor at several points. This latter precaution is to avoid the destructive effects of the surging of the electricity which seems to take place after a flash, and it is of great importance. We have not, however, the space to enlarge on that point at present, but shall probably return to it in an early issue. For the present we must confine ourselves to the points mentioned above, with the addition of a caution against undue elevation of the point of a conductor. A lightning flash is too dangerous a visitor to be invited. Ample preparations must be made for its reception, but still its visit is not desirable, however hurried it may be.

A New Electric Bell.

The three illustrations on this page are of the new "Greeley Iron Box" bell, just brought out by Messrs. The E. S. Greeley & Co., of New York. New electric bells have been projected upon the market in such numbers that a specific description is necessary to show the difference. An interesting and valuable feature of the new "Greeley" bell is that the base plate is attached permanently to the wall, while the body of the bell, carrying the magnets and contacts, and the bell itself, can be removed. Every provision is made inside the body of the bell for adjusting the tension spring of the armature and locking said adjustment.

Another entirely new feature is that of adjustment of the position of the armature towards the cores of the magnet. The value of this provision is owing to the fact that in assembling rapidly thousands of bells of this character, it will always happen that a certain proportion will have the armature a 64th of an inch too far in one direction, which will occasion the armature to rock upon the magnet cores, or it will be in the opposite direction, causing a loss of 20 to 50 per cent. of the magnetic force.

Another feature is the cover itself, which is provided with a guide for the single screw which fastens it, together with the body of the bell, to the base plate, and obviates all necessity for "fishing" when the bell may be in an awkward position for the line constructor.

The locking of the cover, body and base plate, by means of the single screw mentioned, encloses the works in a practically dust-proof case.

The Edison Company at Burlington, Ia.

One of the most important of the many new business enterprises that have recently come to Burlington since our citizens began to awaken to the great possibilities of our city, says the *Hawkeye*, is the Burlington Edison Electric Company. This is a company recently incorporated and embracing some of our leading citizens who propose to introduce the inventions of the great Edison and give Burlington all the benefits of electric light and electric power in their various forms. The city council, at its session last Monday night, granted the company a franchise, and all that is now needed to finally inaugurate the enterprise is to have part of the stock taken by our citizens as a guarantee that the enterprise will have a generous local co-operation.

The company is now negotiating with several parties for a suitable piece of ground for the location of the works. The plant will cost from $30,000 to $40,000, and will be one of the most substantial character and equipped with the very best appliances for generating, conducting and applying the electric current to its various uses. Every inducement ought to be offered the company to make a large investment so as to secure to Burlington at the outset the very best advantages and at as early a date as posible.

Contracts have already been made for supplying power to parties in the city and the present indications are that the company will be able to start with contracts amounting to not less than five hundred horse power.

Minneapolis, Minn.—Edison Illuminating Company of Minneapolis has been incorporated; capital stock, $500,000.

Montreal, Canada.—The Hibbard Electric and Manufacturing Company has been organized here, with a capital of $150,000.

Coshocton, O.—The Coshocton Electric Light and Power Company, of Coshocton; capital, $10,000. Houston Hay, and others, incorporators.

Newburgh, N. Y.—The Electric Light and Power Company, of Newburgh; capital, $100,000. John J. Moore, New York, and others, incorporators.

Chicago, Ill.—Chicago Cold Bending and Coiling Pipe Company; capital stock, $150,000. Incorporators, George W. M. Reed, George H. Rozet, and Earl B. Smith.

Central City, Cal.—The Gilpin County Light, Heat and Power Company has been chartered. Alfred Luckard and others, incorporators. The capital stock is $25.000.

Newark, N. J.—The Tucker Manufacturing Company has filed a certificate with the county clerk, setting forth that its corporate name had been changed to the Tucker Electrical Construction Company.

Vancouver, W. T.—Articles of incorporation have been filed of the Vancouver Electric Light and Power Company, with a capital stock of $15,000. This corporation proposes to furnish electric currents for the purpose of producing electric lights, etc. The full amount of stock has already been subscribed by the principal business men of the city. The trustees are David Wall, Louis Sohns, B. F. Shaw, Charles Brown, Wm. E. Maxson, Wm. S. Patten, and John O'Keane.

*** The Telephone Association meeting in New York City, beginning Sept. 4th, promises to be very well attended.

Capital Punishment Under the New Law.

The chief reform in the infliction of the death penalty adopted by the act passed at the last session of the Legislature is the substitution of electricity for the gallows.

As to what instrument or process the fatal agent shall be administered the law is silent. It simply says that "the punishment of death must, in every case, be inflicted by causing to pass through the body of the convict a current of electricity of sufficient intensity to cause death." It will probably be for the executioner, the warden of the State prison where the execution takes place, to determine by what means to apply the electric death shock.

Besides this leading reform the new law makes several radical innovations to which the public attention has been little called. The day of the execution is not to be fixed by the Court, as it now is, but only the week. The time of the execution within the week is left to the discretion of the warden, who acts as executioner, and he is forbidden to make any previous announcement of the day or hour except to the persons allowed by the law to be present as witnesses. Literally interpreted the law prohibits the previous announcement, even to the condemned man himself, though it is not likely that such a practice will be adopted.

Another radical change is that the death penalty must be administered in one of the State prisons. That is a commendable improvement of the present practice, which provides for executions in every county of the State.

The law very properly limits the persons permitted to be present to a very small number, but it then proceeds to make an innovation which ought never to have been enacted. It declares that "no account of the details of any such execution, beyond the statement of the fact that such convict was on the day in question duly executed according to law at the prison, shall be published in any newspaper." It may be doubted whether a State Legislature has the power at this day and in this country to dictate what shall or shall not be published by the press. But, however that may be, the above provision, as a matter of fact, will be futile and a dead letter. A graphic account of the first execution by electricity would be apt to appear in the *Herald* on the following morning, and perhaps in the columns of some of our enterprising contemporaries also.

Such publication will be a necessary function of journalism, a duty imposed upon a wideawake newspaper, and in this case a duty of exceptional importance to science, to the world, to humanity. For the first time in history electricity will be used as a means of putting criminals to death. The first attempts will be necessarily primitive with respect to appliances and operation—mere experiments. Let these be described to the would and needed improvements will follow from science and genius. This vital consideration was overlooked by the Legislature. It will not be overlooked by the *Herald.—N. Y. Herald.*

A Balloon Inflated by Natural Gas.

The first balloon inflated with natural gas has been tried. It has been a question as to whether or not natural gas would float a balloon to any considerable height. This one was filled from a pipe until a gauge indicated that the silk, which was enclosed in strong netting, was bearing 20 pounds pressure. Then George Ayers, an amateur æronaut, climbed into the basket, and the balloon was cut loose. It rose steadily until an altitude of about 2,500 feet was reached, when a current of air was struck which bore the balloon and its single passenger away to the southeast.

Lightning Put Out the Lights.

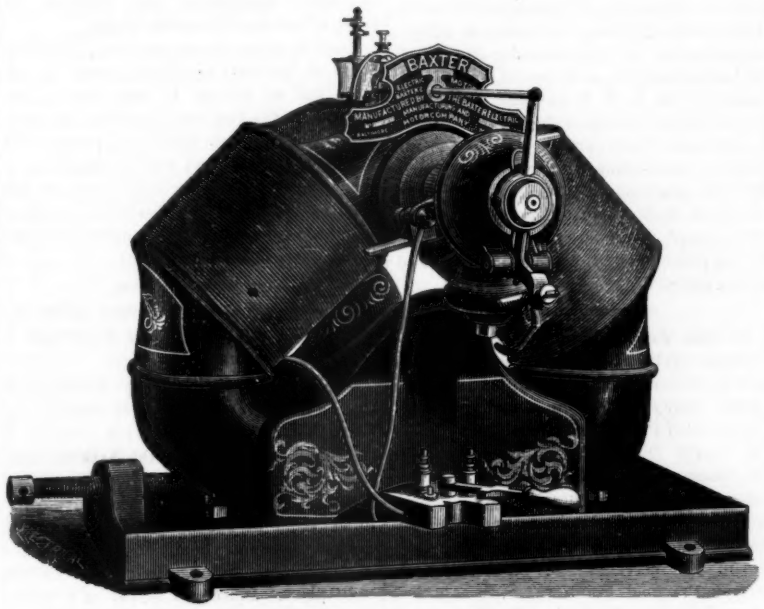
A sharp flash of lightning followed by a terrific peal of thunder startled the large crowd in the exposition buildings one night last week at Cincinnati, Ohio. Instantly all the arc lights in the building went out and the government exhibit and machinery hall were left in total darkness. It seems that the electric current from above struck the dynamos and extinguished the lights. When the current had passed the dynamos were started up again all right.

A young gentleman from New York, who happened to be looking into the mouth of the Gatling gun at the time of the occurence, thought the gun had exploded, and was scared almost to death.

The Baxter Motor.

We present in this issue a cut of the latest design Baxter constant current motor, containing all improvements and changes made up to date. In general appearance it differs little from the motors of the old design first placed upon the market, the most noticable alteration in appearance being the shape of the field magnets, which are made round instead of oval as before.

In the old design, the pole pieces and magnet cores were made of solid cast iron; the company now employs a wrought iron core cast solid with the pole pieces. It has heretofore been considered a difficult task to effect a perfect amalgamation between a piece of wrought iron and an iron casting; but after repeated and extensive experiments to produce such a combination between the core and pole piece of a dynamo or motor magnet, the Baxter Company has succeeded in obtaining a perfect and reliable weld. The difficulties of such a process are that, as cast iron is poured in hot, it almost instantly chills and shrinks; and if the wrought iron core is warmed up to prevent the chilling, the unequal contraction in cooling causes the wrought iron and cast iron to shrink away from each other; in either case rendering them unfit for magnets. The Baxter process obviates both of these difficulties by treating the wrought iron core in such a manner as to coat with a metallic oxide the ends required for the weld. This oxide, when in contact with the molten cast iron, gives up its oxygen, which, uniting with the carbon of the cast iron, reduces the metal in the immediate vicinity to a decarbonized state, and the residuum of the oxide, assisted by the increased temperature due to the combustion of the carbon in the cast iron, reduces the wrought in the immediate vicinity to a liquid state and thus forms a perfect amalgamation of the metals, affecting a perfect joint.



THE IMPROVED BAXTER MOTOR.

This use of the more permeable wrought iron core, projecting as it does some distance into the body of the cast iron pole piece, thus raising its saturation limit, has enabled the company to secure more reliable results and a higher efficiency in the working of their motors, as well a greater ease in handling and manufacture of the round over the oval core.

The motor in its new shape presents a very neat and compact appearance, but its good qualities in the commercial and electrical fields are too well known and appreciated to need a repetition here.

Two Supreme Occasions.

A cynical man says that there are two occasions when he would like to be present. One is when the gas company pays its water bill; the other is when the water company pays its gas bill.—*Texas Siftings*

—— The Merced (Cal.) Electric Light Co. are erecting poles on all principal streets of the town, and expect to have the town lighted inside of sixty days.

A "Voice-Canning" Factory.

These phonographs and graphophones suggest to me, says a Washington correspondent, that the Government should at once begin canning the voices of its orators. Why not preserve the voices of the present for the edification of generations yet to come? What's the matter with a great national voice-canning establishment? Why not have debates of Congress and great political speeches and educational and social addresses preserved? File these cylindrical records away in the archives of the government for all time. Who knows what future historians may tell of the eloquence of our time? What stories of dictators and tyrants and cruel monsters of the present age may not curdle the blood of future Americans? What shall the answer be when the dim and musty records fail to picture the mellifluous tones, the extreme suavity, the convincing logic, the soul-inspiring eloquence of our statesmen? To this instrument the historian of the future must turn for the truth. Let him listen to the encyclopedial utturances of President Cleveland, the Demosthenic mispronunciation and incoherence of Senator Reagan and the awful nasal twang of Mr. Bland of Missouri. The voices of Funston of Kansas, Henderson of I wa, Symes of Colorado, and Taulbee of Kentucky, were evidently made for all time. Nature intended that they should go "echoing down the ages." How are they to echo unless they are preserved in phonic form for future use? Who, in the years to come, is to appreciate the emphatic "House will come to order!" of Speaker Carlisle, delivered in that peculiar circumflexial tone, with rising inflection at both ends, unless it can be heard? Who can tell what might be the effect ages hence if the instrument should grind out "Little Willie, How We've Missed You," as originally sung by Hon. Roger Q. Mills, of Texas, to Hon. Wm. R. Morrison, of Illinois? Or what might occur if the wonderful machine should repeat for the edification of its thirty-fifth century hearers the voices of Senator Ingalls, of Kansas, and Senator Voorhees, of Indiana, in that charming little duet, "Oh, You Little Darling."

Representative Samuel R. Peters, of Kansas, is the only Congressman who has thus far ventured to indulge in the luxury of a graphophonic private secretary. He owns one of these machines, and has already become an expert operator. Every morning when he receives his mail he sits down to his machine and tells it in all confidence just what he wants to say in reply to the letters from his constituents. And if during the day or in the evening he takes a notion to "write a few lines" to a friend or constituent, he tells his graphophone all about it. If in the middle of the night he is suddenly inspired with an idea he simply reached out his bed, grasps the receiver, brings it to his mouth, and in the darkness fills the cylinder full of "eloquent gems of thought." Once a day Mr. Peter's clerk comes along, puts in the "inspired" cylinders, one at a time, starts the machine, and transcribes what Mr. Peters has told them during the twenty-four hours.

When the subject of mail subsidies was before the the House, Mr. Peters made one of the ablest and most eloquent speeches of the session. The night before he delivered it he sat down in the darkness of his room, after returning from an evening session, and eloquently told his graphophone what he expected to say on the morrow. When he had finished this rehearsal of his speech it was clearly in his mind, and it was also recorded on the cylinders of the machine. Next morning he delivered the speech in the House just as he had talked it over to himself and his graphophone the night before. The official stenographers took it down in short-hand, but they never used their notes.

"I have that speech already prepared," said Mr. Peters to Chief McElhone. "It's recorded on the cylinders of my graphophone."

"Bring them here," was the suggestion of Mr. McElhone.

The cylinders were brought to the reporting room, placed in a graphophone, and a lady operator transcribed the speech as the machine talked it off.

It is a great invention and appears likely to come into general use as an aid to congressional stenographers and private secretaries.

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☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Timothy W. Sprague, Massachusetts Institute of Technology, is our representative at Boston, Mass.
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NEW YORK, AUG. 25, 1888.

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The Editor of *Modern Light and Heat*, Boston, in the last issue presented a very interesting and well arranged review of the attendance and work of the past seven meetings of the National Electric Light Association.

The attendance at the Cleveland convention of the American Association for the Advancement of Science, was very large, and comprised some of the ablest and most prominent scientific minds of the country. President J. W. Powell delivered an able and comprehensive opening address, and other strong opening addresses were delivered by the presiding officers—vice-presidents—of the various sections. A great number of scientific papers on live topics was read. The Association was handsomely received by the citizens of Cleveland.

Curiously enough, Emmensite, the new explosive, invented by Dr. S. H. Emmens, before which dynamite and nitro-glycerine shrink into comparative insignificance and tremble for their future existence, turns out to be an electrolyte of considerable value. It is exceedingly cheap and makes an admirable substitute for sal-ammoniac in cells of the Leclanche type, as it has no tendency to "creep." Its E. M. F. averages high. As an interesting example of the "*tour de force*," the inventor of this curious substance uses it about his establishment to produce light and drive the machinery for manufacturing the substance itself; and again uses it in his chronograph to measure the velocity of projectiles propelled by the same substance used as an explosive.

The Electric Light Convention in this city promises well. The purely scientific side will be presented by men of prominence and special ability in their lines, and comprises the names of Prof. E. L. Nichols, of Cornell; Dr. Louis Duncan, of Johns Hopkins; Dr. Leonard Waldo, formerly of Yale, and others. From the practical, commercial workers in electrical science, papers will be read by Wm. Lee Church, on "Electrical Steam Engineering;" C. C. Haskins, on "Some Practical Pointers;" S. S. Wheeler, on "Electrical Conductors in New York City;" O. B. Shellenberger, on "Measurements of Alternating Currents for Commercial Purposes;" F. B. Crocker, on "The Ideal Motor;" E. G. Acheson, on "Disruptive Discharges of Underground Conductors." There will be several other papers and reports of committees. A complete programme will be announced next week.

FOR THE ADVANCEMENT OF SCIENCE.

The American Association for the Advancement of Science holds its thirty-eighth meeting at Cleveland for the week beginning August 15.

This organization, numbering about 2,000, includes in its membership nearly every person prominently engaged in scientific pursuits, covering the broadest range from those absorbed in pure science to those devoted to its applications directly pertaining to what is termed practical life. Its organization is sub-divided into sections for holding sessions for consideration and discussion of papers upon mathematics and astronomy, physics, chemistry, mechanical science, geology and geography, biology, anthropology, and economic science and statistics.

True to its name, it has fostered the advancement of science, and the principal discoveries of scientific truths made by Americans during the last generation have been made public through the meetings of this body.

Their first president, W. C. Redfield, first reduced meteorology to that scientific basis which finally culminated in the establishment of the national weather bureau. A. D. Bache, the founder of the Coast Survey, Joseph Henry, the inventor of the electro-magnet, and scores of other creations scarcely less valuable, whose wisdom organized the broad policy of the Smithsonian Institution at Washington, the great Agassiz, Gillis, who started the national observatory, and Davis, who began the nautical almanac, were all enthusiastic members of the American Association for the Advancement of Science.

At the meeting held in Columbia College last year, 250 papers were read, many of them being of especial interest to electricians, which were presented in as full abstract in the ELECTRICAL REVIEW as the pressure upon our columns would allow, by reason of the Electric Light Convention, held in Boston at the same time, notwithstanding that the ELECTRICAL REVIEW was increased to 40 pages to make room for the unusual amount of news in the electrical field at the time.

The Cleveland meeting promises to be one of the most successful ever held, and will doubtless be compared to the famous meetings of the association held at Boston in 1880 and Philadelphia in 1884.

Cleveland is a very desirable place for the meeting of such a body. The attractions of the city in its natural beauties, the hospitality of many prosperous people, its surroundings, industries, institutions and location, all being of the most favorable nature.

There is a large local committee, including many of the most prominent people in the State, but we venture to state that a due amount of the vast work involved in entertaining such a large number of people, will fall upon the able and willing shoulders of Dr. Leroy M. Avery, widely known by his book upon physics, and also in the practical applications of electricity connected with the Brush Electric Light Company.

THE INTERESTS OF MOTOR MEN AT THE ELECTRIC LIGHT CONVENTION.

Those who are in any way interested in the electric motor ought not to miss the opportunities that will be offered to them at the coming convention of the National Electric Light Association, for acquiring information. It seems scarcely necessary to remind them of the mutuality of interests existing between them and those engaged in developing and perfecting the electric light plant. Indeed, in so far as concerns distribution of electrical energy, their interests are almost identical. If the application and possibilities of electricity were so well understood and so long under investigation as steam, there would then, perhaps, be some excuse for apathy or indifference on the part of those far removed from the place of meeting. On the contrary, it is, as every one knows, only in the first stages of development; new methods of utilization, of generation of control, new means of line and station construction are continually appearing, because of the constant experimentation and novel forms of apparatus and contrivances, mechanical and scientific, for overcoming obstacles, which appear with almost confusing frequency.

So valuable are the discussions concerning these to those practically interested, that, if such conventions as that about to meet, and others in various other scientific departments, were to meet each month, with full attendance from all over the country, there would be little need for technical newspapers. For it is immediately obvious that listening to those who have constructed or devised new apparatus or systems, with liberty to ask questions where points are not clear, is of far greater advantage to practical men than any printed description can be. Indeed, too high an estimate can scarcely be put upon this means of acquiring information and the records of previous conventions, to which representative men have come from parts as remote as California, returning from year to year, prove conclusively that even the longest and most costly journey is amply repaid.

Those who have discovered improved systems of distribution, and are slow in disclosing them for the fear of giving more than they get in return, we would especially address ourselves to, assuring them that it is to their advantage to do so where a general convention of men similarly engaged is sitting. It encourages others who have developed other parts, which, with them are lacking, to make them known, and, indeed, usually leading to further improvements. We say again let the electric motor men, as well as the lighting people, not to forget that it is to their advantage to attend the coming convention.

OUR CHICAGO LETTER.

(Special Correspondence.)

The United States Military Telegraph Corps has just closed its Eighteenth Annual Re-union here. There were meetings and recognitions of parties who have not met perhaps, since the war, and now and again a silent tear has been the result of refreshed memory when some incidents of those days of peril were recalled.

The meeting was held at Gore's Fire Proof Hotel, a new nine story building, lighted throughout by electricity, mention of which I made a short time since.

In connection with these military gentlemen's organization the Old Timer's Association annually meets, because nearly all the former gentlemen are also members of the second institution, and an opportunity is thus offered to kill two birds at one shot.

The gray-headed boys of the latter army of telegraphers boast of their youthful and gay commander (who on one occasion assisted the President of the United States in rounding up the close of his annual message), he who has so faithfully stood by the fraternity through thick and thin, and through whose earnest endeavors the saddened heart of many a telegrapher's widow has been gladdened by a remembrancer far better than words. He was the father of the T. M. B. A. if I remember aright. Long may he remain their honored leader.

The soldier telegraphers have a muster roll of about 240, and there are about 60 more, or 300 living, of the 1,200 youths who went into the service of the government, as operators. What made their condition one of peculiar hardship was the fact that aside from superintendents and chiefs, the operator had no place which any one was bound to respect. He was often in the thickest of the fight, and the dangers he braved as shown by the loss on the battle field by wounds, exposure, disease and prison abuse, was one-twelfth of the entire corps.

Jesse H. Bunnell, at Gaines' Mills, saved Fitz John Porter's Corps by telegraphing to McClelland from behind a tree where he had hidden. Wm. J. Dealy, of New York, was the first Union operator captured. President Plum was General Pap. Thomas' chief operator and was through the battles of Jonesborough and Nashville. Jim Pettit was gobbled by the Johnnies at his key, and was one of the only two who got out of Canata Prison alive, and he came near dying. Newt. Crittenden, another of the Chicago boys of to-day, placed the Union forces in possession of 100 miles of the Ohio and Mississippi road by means of his key, and Cass Sholes says he is positive he could taste lead at the Resacca, Ga., fight. Steve Robinson, of the Board of Trade here, went from Memphis with Grierson's Cavalry, on the raid of which Charley Summers spoke by quotation: "Solomon in all his glory was not arraid like one of these." Robinson was well into the enemy's country, when he was ordered back with dispatches. Ambushed and riddled with buckshot, he was left for dead. He blundered into a creek, revived, and a negro conveyed him to Memphis.

Ed. Whitford, all alone on Red River, was feeling somewhat homesick, when a rebel boat, which had been fired on, and whose captain had been wounded by the Yanks, made the landing.

Whit. hadn't the accent perfect, but he convinced the captain that he was from *Ten*-nessee, and was let off by the captain when he gave three lusty cheers and a tiger for Jeff. Davis.

During the session, the sympathy of the association was telegraphed by the President, W. R. Plum, to Mrs. General Sheridan.

A ride on the lake on the second day and a banquet closed the proceedings.

J. D. Reid, Wiley W. Smith, W. S. Ives, (New York), E. Rosewater, of Omaha and others responded to toasts, and the association adjourned to meet on the second Wednesday of September, 1889, at Louisville, Ky.

The delegation to the meeting of the Electric Light Association from the west will rally at Chicago and go with the boys from here. Parties intending to take the trip should correspond with W. A. Kreidler, Western

Electrician, Chicago, who will tell them just how much cheaper than full fare, they can go. K. has a rate which will astonish somebody.

Mr. W. B. Pearson, general agent here for the Ide engines, has just sold a 30 horse-power *Ideal* engine to the city to run the the north side crib circuit which Professor Barrett will soon put in. This was part of the original scheme of the professor, but the money gave out just then. It will all come round right in due time. C. C. H.

Chicago, August 20, 1888.

Protection of Watches Against Magnetism.

C. J. H. WOODBURY, BOSTON, MASS., BEFORE AMERICAN ASSOCIATION AT CLEVELAND.

The growing and even general use of electricity for illumination and for the transmission of power, has added much to the knowledge of electrical phenomena, and also called the general attention of the public to matters long known to those familiar with physical science.

The introduction of iron ships first presented new problems of compass adjustment and chronometer protection, in which the disturbing effect of the magnetism in large masses of iron is compensated by means of smaller masses of iron, arranged to turn or to counteract these lines of force.

Public attention was first called to the influence of magnetism on watches at the Paris Electrical Exposition, where visitors could leave their watches near the entrance—an arrangement which gave wits ample opportunity for comparisons with pawnbrokers and bathing houses.

My first experience with the effects of electricity on a watch was comparable to that of the good old soul who was advised to try electricity for some chronic ailment, and declined, saying that she was struck by lightning several years before, and it had not done her "a morsel of good."

I was struck by lightning in July, 1881, at a time when I was thoroughly drenched with water; and the only permanent damage was received by my watch, which was marked on the back of the case with two straight black stripes, each about half an inch in width, extending across the back and joined together at one end like a letter V. Three of the arbors in the movement were broken, but there was no discoloration except on the outside.

Another watch, which possessed a remarkably uniform rate, and was highly valued for its accuracy, yielded to the temptation offered by the magnetic fields around dynamos and became very uncertain, losing time at irregular intervals, and at varying rates.

The usual methods of demagnetization, such as revolving magnetic fields, twirling the watch slowly out of a strong field, and reversals of magnetization, were all tried with the result of lessening the evil, but not removing it, as it seemed to be impossible to bring back the movement to the old rate.

There have been many expedients for removing magnetism from watches, the latest bit of charlantry being to bury the watch in the ground, a proceeding which, it is needless to state, would ruin a watch, but not affect its magnetism.

It is surprising how weak a magnetic field will stop a watch, a small magnet being sufficient for the purpose; and far weaker magnetic fields will interfere with the rate of a watch to an extent which will injure its value as a timepiece.

There are two types of attachments designed to protect watches against magnetism, one being a small disc of iron taking the place of the inner cover of a watch case, and the other a box or case surrounding the watch case, like the outer case of a bull's eye watch. Without endorsing any of the extreme statements declared to be fundamental principals of magnetism by those engaged in the sale of either of these devices, it is evident that any magnetic body will distort lines of force in a magnetic field; and it was considered worth while first to submit the metal case to direct experiment.

The magnet used was a small dynamo, containing cast iron to the weight of about 450 pounds. The armature was disconnected from the circuit, and the field coils connected to an electric circuit, in order that the watches should not be subjected to jar from a revolving armature.

Remembering the engraving published in some of the electrical papers, representing one of these cases in a magnetic field, and covered with iron filings bristling in all directions, while filings inside were in repose, a circular piece of cardboard was placed in the case and dusted over with iron filings which had not been magnetized, and the box was closed and placed on a block of wood a foot from one of the poles of the magnet.

An electric current sufficient to saturate the magnet passed through the field coils for a few moments, and the circuit was broken before the case was opened in order that the contents should not be directly exposed to any attraction except what was transmitted through the iron forming the case. On opening the case it was seen that the iron filings had been drawn towards one side of the card, and arranged in striae in the ordinary manner whenever they are exposed to a magnetic field.

A watch which had been set to exact time with one in an extreme part of the room was placed in the case, and in like manner exposed to the magnetic field for five minutes.

When the case was opened it was found that the watch had stopped at the instant that the magnet was charged; and the movement has been magnetized to an extent which has robbed it of any present value as an accurate timepiece.

At the same time a Waterbury watch exposed to the same conditions, except that an iron case was not used, stopped when the magnet was saturated, but started again apparently uninjured as far as could be learned from a day's run.

As it was evident that the case did not adequately protect the watch, experiments were not made with the shield referred to, which contained a small fraction, perhaps one-tenth, as much metal as the case.

These watches were not exposed to any more severe tests of magnetism than would be liable to be offered to a watch worn on the person of one around a dynamo or motor, except that a passenger in a motor car would naturally be in a sitting position, and the watch would be exposed for a longer time to lines of force than would be the case around a dynamo, where the person would not probably remain in a stationary position so long a time.

Some time ago I examined a watch containing the inventions of C. A. Paillard, of Geneva, in which the hair spring and balance were made of alloys of palladium, the escapement being made of steel, and found that although a weak magnetic field did not produce any apparent effect upon the movement, yet it was stopped by exposure to a very strong attraction.

This difficulty would be intermittent in its nature even under the extreme conditions of magnetic force which stopped the watch, because the balance and hair spring were composed of non-magnetic alloys.

Subsequently, when the same make of watches were produced containing the whole escapement as well as balance and hair spring composed of alloys of palladium, I bought one subject to guarantee, and exposed it to the tests mentioned above without stopping it or interference with its rate.

It is probable that long continued exposure to an intense magnetic field would tend to accelerate the rate of such a watch, because the resistance to cutting the lines of force would slightly reduce the length of the arc of vibration, and therefore increase the number of beats during a given time; but I have not had time to learn by experiment whether these conditions of continuous exposure to an intense magnetic field could under any circumstances affect the rate of such a watch. It is evident, however, that a watch worn on the person would not be exposed for a sufficient length of time to receive any modification of rate. In any event, such influence upon rate would not be permanent, but would continue only while the rapidly moving parts were cutting lines of force in a magnetic field.

The alloys of palladium referred to possess an elasticity comparable to steel, as is shown by its practical operation. It is undoubtedly not oxidizable in moist air; and the alloys, being composed of both paramagnetic and diamagnetic metals, must approximate more or less closely to a neutral substance.

Several of the types of watches made in this country have been advertised as containing non-magnetic movements, using alloys of other metals than palladium.

Before purchasing the Paillard movement, I endeavored to examine with a view of purchasing, some of those movements, but they were not on sale at the time.

The conventional claim of enthusiastic inventors is that their productions are going to revolutionize the whole world, or perhaps only the specialty to which their inventions pertain; but the experience of the writer shows that the present use of dynamos, and the prospective general introduction of motors, especially upon street railways, will render watches which are unaffected by magnetism a general necessity.

Getting Ready to Eat Clams.

The annual clambake given by Mr. Eugene Phillips to his electrical friends is announced for September 1st, at Vue de l'Eau, Providence. The reception committee is composed of H. C. Davis, New York; Fred. A. Gilbert, Boston; John I. Sabin, San Francisco; E. B. Baker, New Haven; A. C. White and W. H. Sawyer, Providence. As this occurs immediately after the Electric Light Convention in this city, a committee, of which Mr. C. H. Barney is chairman, has been appointed to arrange for an excursion by boat over to Providence, Friday night, returning Sunday night. A special rate will be secured, and on the return a stop will be made at Newport.

Manufacturing Notes.

The Standard Carbon Works, Cleveland, Ohio, have shut down temporarily, while certain differences between General Manager Boulton and the other directors are being adjusted.

The suit of the Thompson-Houston Company against the American Electric Manufacturing Company for infringement of patent relating to regulator for dynamo has been decided by the Massachusetts Court in favor of the plaintiff.

Mr. W. N. Gray, western agent of the Mather Electric Company, is exhibiting two 500 light dynamos in the Cincinnati Exposition, lighting the Art gallery, Dexter Hall, and the educational exhibit. The plant, which is in charge of Mr. Frank V. Pinkham, of Manchester, Conn., is a complete success.

The Shultz Belting Company of St. Louis, has just made and put into the plant of the East River Electric Light Company, New York City, one of the largest ever made in this country, and the largest ever made west of New York. It is 123 feet long, 58 inches wide and weighs 1,300 pounds. It is made of double leather, is to transmit 1,000 horse-power, and takes the place of an oak-tanned belt. The company made the belt, delivered it in New York and had it transmitting power inside of six days. The belt was cemented only, no pegs or rivets.

NEARLY 1,000,000 LEATHER LINKS USED.

Chas. L. Ireson, manufacturer of Ireson's self-adjusting leather link belting, 97 High St., Boston, Mass., reports obtaining the two largest orders ever given for link belting, namely: through Mr. G. L. Edgar, manager, belts for the entire station of the Edison Electric Illuminating Company Head Place, Boston, as follows: fourteen 12" link belts, each 43½ feet long, total length 609 feet, weight 2,436 lbs., number of links required 334,950.

Also through Mr. John I. Beggs, Vice President and Gen. Manager, Edison Electric Illuminating Co., New York City, full order for belting new station in New York City as follows: sixteen 15" link belts, each 48 feet long, total length 768 feet, weight 3,840 lbs., number of links used in its construction, 528,000. Making a grand total of 862,950 leather links required to produce these belts.

President S. A. Duncan, of the National Electric Light Association, was a New York visitor last week, conferring with the chairman of the executive committee in relation to the next convention. Mr. Duncan's many friends will be glad to hear of his excellent health again after his continued illness, and he is prepared to most actively engage in making the New York meeting a pronounced success.

A WELCOME HOME.

THE ELECTRIC CLUB HONORS ITS RETURNED PRESIDENT.

The most elaborate dinner ever served in the Electric Club was given Thursday evening of last week, in honor of the return of the President, Mr. Henry C. Davis, who had just arrived after having been abroad for over two months. The dining room on the second floor had been tastefully decorated with vines and blooming plants, and several magnificent banks of flowers, bearing such mottoes as "Welcome Home," "Our President," "The Electric Club," etc., as well as a *bontonniere* at each plate, handsomely set off the artistically arranged table. The courses of food and wine were of the finest quality, splendidly served and would have done credit to the most perfectly arranged and managed Club in the City of New York. The excessive heat of the evening, was greatly lessened by the use of the "C. & C." electric fans, and kept the diners comfortable all during the evening, notwithstanding that it was the hottest night known in New York for many years. In this respect, electricity again came to the rescue.

Mr. Willard L. Candee, as master of ceremonies, sat at the head of the table with President H. C. Davis on his right. Other gentlemen among those present were Geo. M. Phelps, A. J. De Camp and R. H. C. Hill of Philadelphia, P. H. Alexander and R. F. Ross of Boston, H. D. Stanley, Cyrus O. Baker, Jr., A. H. Patterson, Geo. Worthington, J. W. Godfrey, E. F. Peck, Wm. Marshall, J. W. Packard, A. F. Stanley, Jno. A. Seely and three friends, Geo. B. Coggeshall, Charles W. Price, Geo. H. Lewars.

The toasts were all informal, Chairman Candee stating that none of the speakers had been informed of what was expected of them. Mr. Geo. M. Phelps welcomed the president in a pleasant, brief address, well saying that the proof of the fact that they were all glad to see him back could be seen in the presence of the forty or more members who, on this terribly warm night, had come out in clean and proper dress to testify to their regard. The speaker said that every one was glad to see the president back, not because he was an eminent statesman nor yet because he came in time for the event, nor because he was the president of a large electric lighting company, but because he was president of the Electric Club and particularly because he was such a good fellow.

Mr. Davis thanked the gentlemen for the distinguished and unexpected honor he had received in this pleasant reception, and spoke briefly of what he had seen in electrical circles abroad. He had found no work in this field in England that came up to what had been done in our own country, and he returned prouder than ever of his own country, and the active, wide-awake and progressive members of the electrical fraternity. He spoke of the kindness he had received at the hands of a number of electrical people abroad, and concluded by again expressing his great appreciation of the kindly act of the club members in thus welcoming him.

"Our Sister Organization," was neatly responded to by Mr. P. H. Alexander, president of the Boston Electric Club, and a thoroughly informal list of responses followed, and were responded to by Messrs. Patterson, Ross, Godfrey, Worthington, Stanley, Seely, Baker, Parrish, and others. Mr. Patterson grew truly eloquent in responding to the toast of "Our Club," and had the honor of receiving the most long-continued and generous applause of any of the speakers.

Before the meeting adjourned, a vote of thanks was unanimously and heartily voted to Messrs. Baker, Candee and Patterson, who had so successfully arranged and managed the welcoming dinner.

The singing of "For He's a Jolly Good Fellow" and "Auld Lang Syne," concluded the ceremonies in the dining-room, but the members remained for a pleasant hour in the parlors of the club, enjoying music, conversation and the pleasure of being kept cool by the electric fans.

TELEGRAPHIC

.... There are many improvements in telegraphy now being worked out. We expect to see remarkable advances made in this branch of electrical science in the next few years.

.... Employed as telegraph operator at Target Hill, by the West Shore, is Sasi Blushua Sarbadhicary, an Indian, who has served in the capacity of operator in various parts of the world. He is a finely educated Hindu or Brahmin, takes keen interest in religion and education, and is a graduate of the university college at Edinburgh, Scotland.

.... A despatch from Mexico says it is currently reported that the Mexican Telegraph Company is making arrangements to lay a new cable, in order to meet the demands of its increased business. This is said to be the object of Mr. Schrymser's trip to Europe. Congress will be called upon at the next session to estaplish a new Cabinet office—Minister of Posts and Telegraphs.

.... Chief Hale, of Kansas City, Mo., has perfected a new fire alarm device. The invention is a small square box with a projecting hook or latch. It is designed to be attached to a telephone, and to be used both as a fire and police alarm. By pulling down the latch the telephone is disconnected from the Central station and placed in direct communication with the operator at the department headquarters to whom the alarm is given. A dozen of these boxes have been ordered from the East and they will be placed in the newspaper offices, the Board of Trade, and other places in Kansas City in order that they may be thoroughly tested. They are designed to do away with the double system of alarm now in use and to economize time in sending in alarms. A dial to register the number of the instrument turning in the alarm will be placed at headquarters; the operator by pressing a button reconnects the instrument with Central station.

The Phonograph.

"But I don't understand about this phonograph. How is it done? What is it like?' "Why, it is simply talking to a machine instead of to ears of flesh and blood." "Talking to a machine?" "Yes, talking to a machine; not precisely as I'm doing now, but very much the same."—*Boston Transcript.*

Done in One Minute.

A ray of light travels 11,100,000 miles in a minute.

In the United States the telephone is used 505 times, the telegraph 136 times in a minute.

In a minute the lowest sound your ear can catch has been made by 990 vibrations, while the highest tone reaches you after making 2,238,000 vibrations.

In each minute in the United States, night and day, all the year round, 24 barrels of beer have to go down 12,096 throats, and 4,830 bushels of grain have to come to bin.

Of tobacco 925 pounds are raised, and part of it has been used in making 6,673 cigars, and some more of it has gone up in the smoke of 2,292 cigarettes, in the United States, in one minute.

In a minute an express train goes a mile, and a street car 32 rods: the fastest trotting horse $147\frac{9}{15}$ rods, and an average pedestrian of the *genus homo* has got over 16 rods.

In a minute we are whirling around on the outside of the earth by its diurnal motion a distance of 13 miles, and at the same time go along with the earth on its journey around the sun 1,080 miles.

Every minute 600 pounds of wool grow in this country, and we have to dig 61 tons of anthracite coal and 100 tons of bituminous coal, while of pig-iron we turn out 12 tons, and of steel rails 3 tons.

Putting in a New Cable on the Pacific Coast.

More than two years ago the submarine cable connecting Cape Disappointment with Astoria was broken. As the cape afforded a fine outlook of the open sea and commanded a complete view of the Columbia river bar, it was used as a general signal office, not only for the weather, but to report shipping. Vessels crossing out or coming in, as well as those beating about the pilot grounds, could be seen and reported at Astoria and Portland, Oregon. The great importance both to the United States Signal Service and to the shipping interests of the country rendered telegraphic communication almost indispensable. Efforts were made at once to have the cable repaired and communication restored. To accelerate the movement action was taken by the Chamber of Commerce of Astoria and the Board of Trade, and Congress was memorialized to make an appropriation sufficient to cover the expense of raising the old cable and making needed repairs. Congress, after duly considering the importance of the matter, both to the Government and the shipping interests of Portland and Astoria, made an appropriation of only $500. This sum was so inadequate that nothing was done with the line. Previous to this, however, Mr. Griffin, of Astoria, made a number of unsuccessful attempts to raise the cable. So deeply was the cable buried in the sand, that it resisted all attempts at pulling it free. In connection with the $500 appropriation, bids were solicited, but no one could be found who was willing to undertake the contract for that sum. So, for a time, the project was abandoned, notwithstanding the subject was continually being agitated.

Congress finally made an appropriation of $1,000, with the proviso that, should the sum prove inadequate to the purpose, the treasurer could be called upon to the extent of $5,000. With this authority the contract to lay a new cable was let. The contract was awarded the Western Electric Company of New York. This was some time ago. Work on the new cable was soon after commenced, and pushed forward to completion. Between Cape Disappointment and Astoria is four knots, or 4.8 miles.

The cable is all in one piece, and was manufactured near London, England. It is one inch in diameter, and weighs three and a half tons to the mile. It is a single conductor conductor cable. There is a strand composed of seven copper wires twisted together; over this tightly fits a gutta percha covering. This is five-sixteenths of an inch in diameter. Around this is firmly wrapped strands of hemp. There are two layers, each wrapped spirally in opposite directions. Over all is a covering, or armor, composed of galvanized No. 5 wire wrapped as tightly as possible.

Mr. H. A. Storrs, a civil, electric and hydraulic engineer, who has had much experience in cable laying, arrived in Portland a few days ago, and will personally superintend the work. By Wednesday of the present week the cable was expected to arrive.

The Western Electric Company has laid already three cables along the Atlantic coast. Should the cable come Wednesday, it is safe to predict that within a week or 10 days the long interrupted telegraphic communication will be restored between Astoria and the cape.

Efforts have been frequently made to recover the old cable, but without success. The cable was laid some years since, and the changing, shifting sands have buried it so deeply that it cannot be pulled out. In some places the cable is from 20 to 30 feet under the sand. The only way it could be recovered would be to loose the deep sand by hydraulic sluicing, and the old cable would not justify the labor and expense. Some portions of it have been recovered, but there are several miles which will probably be left to slumber forever beneath the waters of the ocean.

.... The American watch factory at Waltham, Mass., is being lighted by the Weston Electric Light Company, of Boston.

Mr. C. A. Bell's Water Jet Telephone.

The discovery that the electrical resistance of a jet of conducting liquid is influenced by mechanical or acoustic vibrations, is due to Mr. Chichester A. Bell, who, says London *Industries*, brought this subject before the Royal Society in May, 1886. The paper was on the sympathetic vibrations of jets, and it is on some observations recorded in this paper that the water jet transmitter is founded. When a jet of water issues from a narrow orifice it gradually becomes discontinuous and breaks up into drops, as shown in the diagram on the left hand side of Fig. 1, which is taken from an instantaneous photograph. The other diagram in Fig. 1 shows a jet of water falling from a tube fixed to a board on to a membrane of stretched india-rubber, forming a cap to a brass tube which can be raised or lowered by sliding in a larger tube resting on a heavy stand. To the upper tube is attached laterally a funnel of vulcanite, which magnifies the air vibrations. With this apparatus either mechanical or sound vibrations communicated to the jet are reproduced with great loudness and distinctness, both of which increase up to a certain point when the length of the jet is increased. After passing this point the sound still continues to increase in loudness while losing its distinctness, until ultimately it becomes a mere unmusical roar, and it will then be found that the jet has become discontinuous. When the board to which the jet is attached is scratched with the finger, or when a watch is held in contact with the jet tube, the sounds produced are loud enough to be heard throughout a large hall. If the jet is spoken to, or whistled to, it is visibly thrown into vibration, and if attached to a sounding board, the sounds are distinctly reproduced. If the jet is allowed to fall upon the top of a small vertical plug, as shown in Fig. 2, it spreads out into a nappe, and Mr. Bell found that this nappe was capable of responding to the vibrations in a similar way to the jet itself, and it is this property which is utilized in the construction of the water jet transmitter.

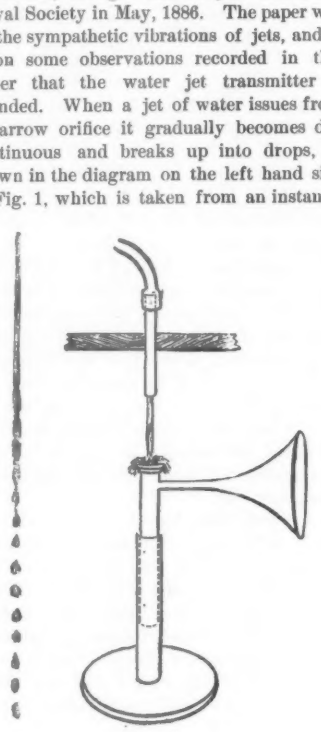


FIG. 1.

In this instrument a jet of conducting liquid forms part of an electric circuit, containing an ordinary telephone receiver. The nappe formed by the impact of a steady jet retains a constant diameter, but when the jet is thrown into vibration the diameter of the nappe undergoes periodic changes. The result is a variation of electrical resistance, which Mr. Bell considers to be due in part to the changes in diameter, and in part to changes in the contact resistance, arising from the motions of the particles of liquid; so that the current passing through the circuit undergoes corresponding continuous variations in strength, as in other forms of telephonic transmitters. The simplest way of passing a current through the nappe consists in allowing the jet to strike normally upon the exposed end of a platinum wire embedded in an insulator, which is impervious to, and is unaffected by, the liquid employed, surrounded by a platinum ring which comes in contact with the outer portion of the nappe. The most suitable liquid is water acidulated with about $\frac{1}{100}$th of its volume of pure sulphuric acid. The battery must be of high E. M. F., but its resistance is of little consequence, owing to the high resistance of the transmitter. The number of cells must, however, not be so large as to produce an appreciable amount of electrolytic action, as the noise produced in the

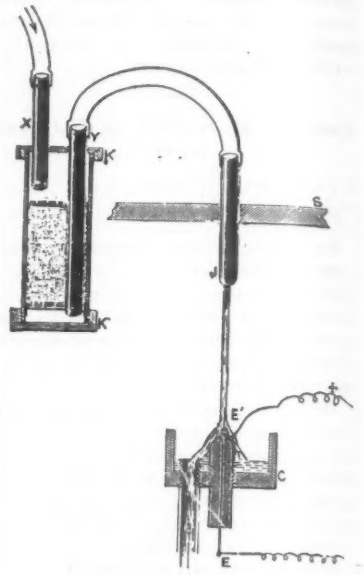


FIG. 2.

receiving telephone by the escape of gas bubbles would drown the sounds due to vibratory changes in the jet. In its original experimental form, the transmitter was made as shown in Fig. 2, where the jet tube, *J*, is mounted in the sound board, *S*. The receiving surface is formed by the end, E^1, of an ebonite plug. A platinum wire, *E*, passes water tight up the plug, and its upper exposed surface forms the inner electrode of the transmitter. The outer electrode, E^1, consists of a small tube of platinum foil concentric with *E*, and insulated from it by the ebonite. The top of the plug is turned to a smooth and slightly convex surface. The plug is screwed into an ebonite cup, *C*, from which the water flows off through a waste tube. *F* is a filter closed by screw caps, *K* and K^1, through the upper of which pass two tubes, *X* and *Y*, which are connected with the reservoir and jet respectively by means of black india-rubber tubing. Two perforated ebonite discs are fitted within the cylinder, and the space between them is tightly packed with coarse cotton, which has been freed from grease by being soaked in a solution of caustic potash, and then thoroughly washed with dilute sulphuric acid and with water. The filter is necessary to keep back particles of dirt which might stop the orifice, and also air bubbles, the presence of which sets up vibrations, and gives rise to a crackling sound in the receiving telephone.

The writer has experimented with this instrument, and found that it reproduced with perfect distinctness the voice of a person speaking in the tone of ordinary conversation at a distance of 20 feet from the sounding board; and when the instrument was placed in a room with an open window, it reproduced the sounds of a piano played in another room, also with a window open, at the opposite side of the street. When an automatic Edison chalk cylinder receiver was used in place of an ordinary Bell telephone, the transmission of conversation and music was also very good. This form of apparatus is, however, not suitable for practical work, as in addition to its requiring separate vessels to act as reservoir and to receive the waste liquid respectively, it must be carefully adjusted before use.

A great many forms of apparatus have been devised by Mr. Bell for practical use, but it is only quite recently that the inventor has succeeded in devising an apparatus which combines simplicity and certainty of action with durability.

Fig. 3 shows the instrument with the front removed. It is enclosed in a case of teak or mahogany about three feet high, and is protected in front by a cover containing a round

aperture, protected by crossed copper wires, opposite the transmitting jet, and in using the instrument the mouth of the speaker is placed at a distance of a few inches from this aperture, as it is neither requisite nor desirable to have a jet as sensitive as that of the experimental apparatus previously described. The electrodes in this instrument are formed of a platinum wire passing up the center of a glass plug, and a concentric ring of fine platinum wire, glass being used instead of ebonite, on account of its greater durability. The jet and plug are contained in a glass tube attached to a wooden box which rests on the bottom of the case, and serves to receive the waste liquid. The glass plug is rigidly fixed in a vertical position, and the jet is centrally adjusted over it by means of the four screws shown at the open upper end of the tube. The filter is seen on the left hand of the jet; its exit tube has its extremity enlarged into a bell which contains the cotton, and the fibres of this are prevented from passing into the narrow part of the tube by a piece of cotton material placed at the top of the bell. The reservoir consists of a wooden box similar to the first, and placed at the top of the instrument, and it is filled by taking out a screw plug in the center of its upper side and pouring the liquid in through

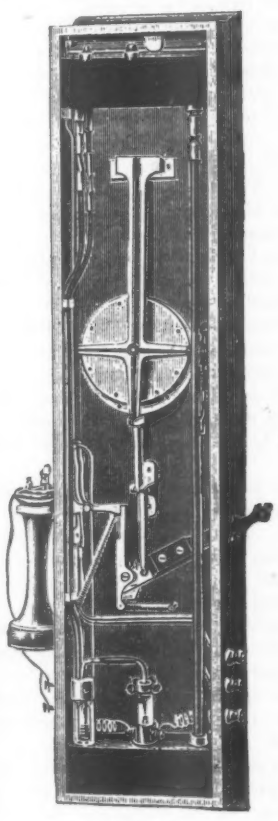


FIG. 3.

a funnel. The terminals of the receiving telephone are connected with the two left hand binding screws, the lower one of which is connected to one electrode of the transmitter, and the upper one to a pair of springs which make contact with the suspension lever when the telephone is removed and the hook allowed to rise. The other electrode is connected with the lowermost of the three binding screws on the right, which is put to earth through the battery. The central right hand binding screw is in permanent connection with the lever supporting the telephone and with the line, while the uppermost binding screw is connected through the call apparatus to the line, and also with a spring which makes contact with the telephone lever when the telephone is hung up.

To speak through the instrument the telephone is taken off, but the hook end of its supporting lever is prevented from rising by means of the vertical lever shown inside the case. The handle on the right outside the case must first be depressed, when a pin on its lower end draws back the vertical lever and allows the telephone hook to rise, placing the telephone in circuit with the line. The telephone lever in rising pushes up a brass rod hinged to it, thus lifting the left hand end of the lever above the reservoir, and opening a valve which allows the liquid in the reservoir to flow down an ebonite tube on the left hand side into the filter. A second ebonite tube passes from the filter and opens into the top of the reservoir, to allow air to escape immediately if the filter has run partially dry from the instrument remaining unused for some time. The depression of the right hand lever compresses an india-rubber bag shown in the center of the case, and drives air into the lower box through an ebonite tube seen on the right hand, which is provided at its upper end with a valve opening inwards, and forces liquid from the lower reservoir through the other ebonite tube on the right hand into the upper reservoir. The quantity of liquid pumped up by one depression of the lever amounts to only a few ounces, and is sufficient for about seven minutes' conversation. As the average length of telephonic conversations is less than this, there will usually be enough liquid in the upper reservoir even for conversations exceeding this time. Fresh liquid can, however, be pumped up during use without interfering with the conversation. The object of the central lever, which keeps the telephone out of circuit until the pump lever is depressed, is to prevent users from forgetting to pump up a fresh supply each time.

The instrument is chiefly valuable for use on trunk lines over long distances, as any leakage on the line can be compensated by using additional battery power, and very good results have been obtained with it on lines upwards of 100 miles in length, and passing through six or eight exchanges, and therefore subject to a considerable amount of leakage. In general, four Leclanché cells are sufficient.

Our account of this remarkable instrument would be incomplete without some description of the system of telephonic communication which Mr. Bell has devised specially for use with the water jet transmitter, its principal advantage being that it requires a battery only at the exchange, but not at the subscribers' instruments. With the transmitters now in use it is not practicable in the case of lines of any length to transmit speech by the direct action of the vibration of the transmitter in varying the resistance of the line circuit, and therefore an induction apparatus is used, the transmitter being placed in the primary, and the line in the secondary circuit, and this involves the use of a battery at each sub-station. In the arrangement shown in Fig. 4, a battery, B, of high E. M. F. and low resistance is put to earth at G, and connected with a line, d,

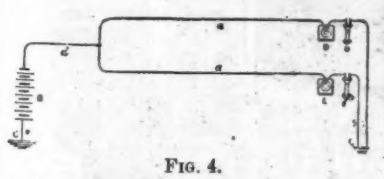


FIG. 4.

which divides into two branches a and a^1, containing the transmitters D and E, and the receivers D^1 and E^1. The receivers are put to earth at G^1 through the wires S S. Disturbances in either transmitter will not be communicated to the receiver at the other station, because the earth connection through the battery forms a low resistance shunt. If, however, a suitable resistance, R_1, is inserted in the branch d, as shown in Fig. 5, this will no longer be the case, and it is easy to make the resistance, R_1, so large that practically the whole disturbance originated at D is transmitted to E^1, more cells being added to the battery if necessary to make up for the additional resistance. The inventor has found experimentally that in the case of short lines (such as ordinary town lines) the resistance of R_1 may be varied from about 2,000 to 8,000 ohms without appreciably affecting the action of the transmitter, supposing the jet transmitter to be used, the resistance of which is about 1,000 ohms. In practice it is desirable to make the resistance of R_1 adjustable, as it may then be varied as may be requisite to compensate for variations in leakage along the line. If the stations D and E were connected directly through a battery at the central station, a battery of twice the E. M. F. would be required to give equally good results, as has been proved to be the case by experiment. Further, if the two stations are connected directly through the central battery, and the transmitters are of unequal resistance, the speaker at the low resistance end will not be heard so well as the one at the high resistance end; but this is not found to be the case when the connections are made as in Fig. 5. A single battery can be used for all the subscribers to one ex-

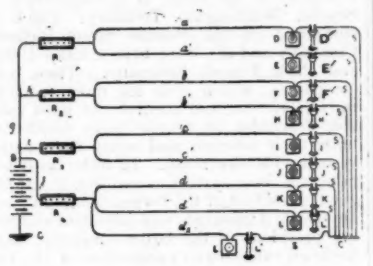


FIG. 5.

change if desired. Thus, Fig. 5 shows two additional pairs of subscribers using the transmitters F and H and I and J connected through the resistances R_2 and R_3 and the wires h and i with the wire g from the battery, and it is found that each pair can carry on conversation without interfering with, or being overheard by, any of the others. Fig. 5 also shows a group of three transmitters connected through the lines d, d^1 and d_2, the resistance R_4 and the wire j with the central battery. In this case a speaker at one transmitter—K for example—will be heard in the receivers, L^1 L^1, at both of the other two stations.

The Good the Speech Recorder Might Have Done.

Suppose we could have graphophonic communication with the years in which Plato lived and philosophized, says the Washington correspondent of the *Globe-Democrat;* and we could listen to his voice and hear his discourse. What a world this would be if we could take down our machine every day and grind out a love scene between Antony and Cleopatra, or a quarrel between Romeo and Juliet. Had there been graphophones in the days of Shakespeare there would have been no occasion for Ignatius Donnelly's cryptogram. We could listen to the vocal testimony of Lord Bacon and Shakespeare and all the rest of the witnesses. The fact that they all have been dead some 300 years would not only add peculiar interest to their voices, but it would prevent them from going back on their own testimony.

How interesting it would be to find graphophones in the pyramids of Egypt. Here a mummified Egyptian monarch, dead some 4,000 years, and there his voice still in a state of preservation and as natural and talkative as ever. What a scheme it would be to have one of these intellectual mummies sit up at eventide and tell us in easy conversational tones just how things were conducted in the land of Isis and Osiris, and what there really was in all this fuss about Moses and the bulrushes, and the children of Israel, and Pharaoh Rameses, and other entertaining topics relating to early days on the Nile. Oh, what we have missed!

Initials by Telephone.

All people who have occasion to telephone names have had great difficulty in making initials understood. B, C, D, E, G, P, T and V sound so much alike that to distinguish between them is almost impossible, and M and N also sound very similar. A system used in the *Palladium* office for some time past, and with very satisfactory results when the person at the other end of the wire has understood it, is to give a word beginning with the letter that is the initial in question. For instance, suppose the name is B. P. Smith. A score or more of other combinations have almost the same sound, but if the sender says, "B. P. Smith; B for butter and P for pepper; B. P. Smith," there is no difficulty in understanding.—*New Haven Palladium.*

Telephonic News

*** The telephone charge for five minutes' conversation between Paris and Marseilles is three francs; between Paris and Lyons two francs.

*** A soldier who was seen to take off his cap while using the telephone informed a questioner that he did so because he was talking to his superior officer.

*** The Pittsburgh telephone exchange is taking down a large number of dead wires in Allegheny. The underground system is in use to quite an extent in these cities.

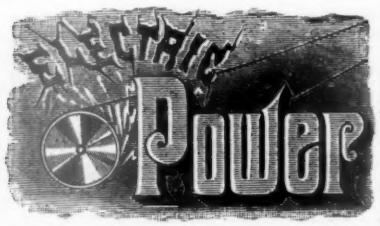
*** A note from Covington, Ky., says: "The telephone company have been putting up new poles all over the city. The wires have been working badly of late, and it is proposed to put in copper wires. There is a rumor current to the effect that the exchange in this city will soon be cut out and moved to Cincinnati."

*** A resolution was presented in the Omaha council providing that the telegraph and telephone and electric wire poles in the public grounds, streets and alleys of the city, be painted, and to prohibit the attachment of advertisements. This will be hard on some of the western barbers who looked upon the poles as their property for sign purposes.

*** A dispatch from London, dated August 14th, says: "Colonel Gourand, representing Mr. Edison, gave an exhibition today at his residence at Norwood, of the inventor's loud-speaking phonograph. A number of journalists and many persons prominent in art and literary circles were present, and all were astounded at the results obtained."

*** An erratic genius suggests a rather brilliant idea in connection with the possibilities of the phonograph. "Just think," he said, "of what the present age is denied by reason of the fact that the phonograph has not been used through all the years of the past. Now suppose there had been phonographs in the Garden of Eden, and there had been handed down to us the cylinders recording the conversation that took place from the morning of man's birth until he was driven from out of the gates of Paradise. How easy it would be for us to sit down, turn the crank and listen to Adam's courtship and to Eve's interview with the serpent. What an endless number of acclesiastical disputations would have been avoided, and how unanimously all the doctors of divinity would have long since agreed.

*** In order to place all parts of the Baltimore police system in instant communication, the police commissioners and Marshal Frey have introduced telephones at convenient intervals in the streets. The telephones are placed in small water-proof iron boxes, conspicuously painted red and attached to the poles at the proper height. The lines run direct to the station. Each sergeant is required to telephone to his station at least once an hour, day and night, thus placing himself in direct communication with his superior officers. The box also containes a call for the patrol wagon, which is used when the vehicle is required to convey a prisoner to the station or a sick or injured person to a hospital. In the central district 60 boxes are used, the southern 32, eastern 32, northwestern 30, western 15. The marshal also has a telephone in his office which connects with the respective stations. The yearly rental paid the Chesapeake and Potomac Telephone Company for the use of the telephone is $900 for the twenty wards which formerly constituted the city. For service in addition $63.96 will be paid for the use of telephones in the new sections. Thirty-two miles of wire are now in use in the telephone system.



The Electric Railway Work of the Thomson-Houston Electric Co.

Some idea of the amount of electric railway business which is being done by the Thomson-Houston Electric Company, may be gained from the fact that the company has been obliged to add two new buildings to its present factory at Lynn.

At the present time there are 16 roads in operation using the Thomson-Houston system, and the following will give a good idea of the company's new business, roads in process of construction, and those just completed.

The overhead construction work at Syracuse is now completed, and the cars will be in operation very soon. The road is four miles in length, and will have eight cars in operation.

The Lynn and Boston Street Railway Company have taken a good deal of interest in the electric railway at Cresent Beach, and have been careful observers of the construction and operation. Their investigation has been of such a satisfactory nature that they have unanimously decided to adopt the Thomson-Houston system for the Highland Line at Lynn. This line will give the Thomson-Houston Company an excellent opportunity to show the excellence of their system, especially in curve construction, as the road has a large number of curves, and grades as high as nine per cent. In spite of these facts, the directors anticipate the best results from the use of this system. The road will be in operation early in September, and will use the single overhead conductor and return rail circuit.

The Nay-Aug Cross Railway, of Scranton, will add four of the improved Thomson-Houston trucks, which will be put in operation this month.

Work on the machinery of the Hoosac Valley street railway at North Adams is being rapidly pushed forward. The road will be equipped under the Thomson-Houston system, using the single overhead conductor and return rail circuit. The track is five miles long, and six cars will be operated.

The Revere street railway has come to a settlement of its differences with the Boston, Revere Beach and Lynn R. R., which has caused considerable delay in the work of construction.

The cars have been largely patronized by excursionists to Ocean Pier, and have been found by them to be a great convenience.

The Des Moines Broad Gauge Railway Company is to equip its seven and one-half miles of track with the Thomson-Houston system, and will operate eight cars having the latest improved trucks.

The Suburban street railway of Scranton received, about two weeks ago, an improved motor truck from the Thomson-Houston Electric Company. This was put in operation on the 5th inst., and since that time has been running successfully, climbing the heavy grades at such speed and with such ease that it leaves no doubt in the minds of the most prejudiced observer that the motors are perfectly adapted for this class of work and are abundantly able to do all that is claimed for them. Two more Thomson-Houston trucks will be added very soon, and it is the intention of the company to have 10 new trucks before long.

The Omaha & Council Bluffs Railway & Bridge Company will put in a model road using the Thomson-Houston system. The overhead construction will be used, and the trucks containing all the latest improvements. This road, which is two miles long, and on which four cars will be operated, will be one of the finest electric railways in the United States. It will be in operation by September 15th.

The tracks for the electric railway at Bangor are now being laid. The Street Railway Company has decided to use electricity, and has made a contract with the Thomson-Houston Electric Company for a complete equipment. The road will use the single overhead conductor, and is two miles long, and will operate 10 cars, each equipped with a 20 horse-power Thomson-Houston motor.

The single car which has been for some time in operation at Crescent Beach, was turned over to the Lynn & Boston Street Railway Company August 1st, and since that time has been in charge of men formerly employed on horse cars. It has run thus far without a hitch of any kind, and is said by the driver to be much easier to operate than the ordinary horse car.

The Seattle Electric Railway & Power Company is the name of a corporation in Seattle, Washington Territory, which is composed of the Seattle Street Railway Company and the West Street, Lake Union and Park Transit Company. These two companies, which own the most valuable railway system, and control the most valuable franchise in Seattle, have decided to unite their interests and equip their entire system with electricity. In order to determine the best system to use, Mr. F. H. Osgood, president of the former company, and Dr. E. C. Kilbourne, vice-president and acting president of the latter company, have made an exhaustive examination of the various roads and systems in use at present, and have contracted with the Thomson-Houston Electric Company for the equipment of their road, believing that their system is superior in every respect to all others. The road, which is to be in operation January 1st, is four and one-half miles in length, 3,500 feet double track, and will operate five cars. It will be in all respects a model road.

Among the many points of great merit of the Thomson-Houston system may be mentioned three: The underrunning trolley, the motor brushes, and the use of lightning arresters. The trolley arm is so made that at whatever height the conductor may be above the car, the trolley will always maintain an even pressure upon it. This will be found a great advantage wherever it is desired to run under a low bridge or across railroad tracks where the conductor is of necessity suspended very high. The brushes used on the Thomson-Houston motor are self-feeding, and but one pair is required for each motor. There is no change required in them for either a change in direction of the rotation of armature, or change in load. They are, it is claimed, the only brushes used on railway motors which do not cause sparking at the commutator. The Thomson-Houston system is the only one on which lightning arresters are used.

Works and Offices of the New York Belting and Packing Company, and the Okonite Company.

The manufacture of rubber fabrics for mechanical purposes is one of the most important industries in the great American beehive of ingenuity, as no other field of manufactured goods except that of iron is probably more extensive. For a moment call to mind the immense belts, some of them over a mile long, used in the great grain elevators and grain storehouses of New York, Jersey City, Buffalo, Chicago, and elsewhere; the innumerable rubber belts on the horizontal and vertical steam, electric and water motors of the industrial world; the tiny rubber ball on every sewing machine in this and foreign countries. Then think of the many sizes and qualities of rubber hose for steam and water purposes, used on steamships, steamboats, railways, fire engines, and hose for gardens and farms, building and mining, and these are not all, as the New York Belting & Packing Company are ready to make to order any rubber fabric designed to be used in the arts and manufactures, and have the largest factories of the kind in the world located at New town, Conn., and Passaic, N. J. They are all of very large dimensions, and fitted with machinery, tools and appliances of the latest and most approved pattern. Nearly 40 years have been spent by this company in perfecting the manufacture of vulcanized rubber for mechanical purposes, during which time many valuable patents, covering different processes incidental and indispensable to the manufacture of their leading specialties of belting, packing and hose, and particularly for machine belting, vulcanized between layers of a patent metallic alloy, by which the stretch is entirely taken out, the surface made perfectly smooth, and the substance thoroughly and evenly vulcanized, which is of the greatest importance. Their main offices and warerooms are located at 15 Park Row, New York City, and the view which we herewith give is a very faithful and artistic representation of the exterior of the building, which is of extensive proportions and imposing appearance. It is located in the heart of the great business center of the city, near the *New York Herald* building, opposite the Astor House, and directly across the way from the Post Office and City Hall. The offices are numerous, roomy, well proportioned, finished in hard woods, and elegantly furnished. They are splendidly lighted with electric lights and skylights, and fitted with every appliance for comfort and business dispatch, including electric fans and ventilators. The business of the vast concern is conducted by John H. Cheever, Esq., treasurer of the company, a gentleman of wide information, experience and tact. John D. Cheever, a son, as deputy treasurer, shares with his father the great responsibilities of a business running into many millions. A visit to this establishment will amply repay any one for their trouble. They will find much to interest and instruct, and a cordial and hearty greeting awaits every one.

The view of the building presented, also shows the business signs of the Okonite Company, in which the Messrs. Cheever are largely interested, and which is under the management of President Chas. A. Cheever, a man of great experience covering many years in an active connection with important electric light, telegraph and telephone enterprises, who is ably assisted by Capt. Willard L. Candee, who is treasurer of the company, and whose expert evidence in electrical matters relating to his branch of the business is recognized as among the best in the country. Capt. Candee has as an associate Geo. T. Manson, a gentleman widely known and admired for his open, genial disposition, and many high social qualities. Mr. Manson was formerly purchasing agent of the New England Telegraph and Telephone Company, of Boston, and is interested in several electrical companies. Mr. L. A. Sneden is the capable secretary. The Okonite Company are among the largest and most popular manufacturers of insulated telegraph and telephone wires and cables in the United States. The Candee aerial wires stand in the front rank in the electrical field.

The importance of telegraph and telephone wires, made of only pure materials, and of the best insulating character, can hardly be over estimated. The Okonite Company, with extensive works covering several acres at Passaic, N. J., possessed of ample capital and a corps of ingenious and experienced superintendents and operatives, all guided by a master mind in this specialty, are capable to supply the wants of the public, and are rapidly gaining wealth and celebrity by doing so. The offices and shipping departments of the company are located in the upper story of the building we illustrate, and like those of the New York Belting & Packing Company, are convenient and commodious, fitted with every appliance for the dispatch of business conducted accurately and intelligently by a corps of efficient employés. A description of the manufacture of the Okonite wires and cables, and the Okonite tape for making water-proof joints, is hardly within the scope, had we the room, of this article. Several of the leading electrical journals and ourselves in this country and Europe have considered the manufacture of sufficient importance to devote large space to the details, and there is no doubt but that our readers are thoroughly conversant with the subject. The company holds testimonials from the Western Union Telegraph Company, New York & New Jersey Telephone Company, the English Admiralty, the New England Telephone and Telegraph Company, the several torpedo and signal stations of the United States Government, the Citizens' Electric Illuminating Company and Department of Police, of Brooklyn, and from individual persons of noted prominence in the electrical world, all testifying to the durability, toughness and valuable insulating and resisting qualities of their wires under tests and practical trials of the most severe nature, in each of which the Okonite wires have come out triumphant for aerial, submarine and underground uses.

A New Stilwell Purifier.

We are pleased to present to the notice of our readers a description and view of the Stilwell patent live steam-feed water purifier, manufactured by the widely-known and experienced manufacturing company, Stilwell & Bierce, Dayton, Ohio. They have been manufacturers of feed-water heaters for a period of 25 years, and some time ago reached the conclusion that in order to effectually meet the entire range of requirements in that line, some form of machine, different in construction and application from anything heretofore in use, was demanded.

The Stilwell open heater of this company, which uses exhaust steam, is very popularly known, and is satisfactory where the water does not contain sulphates of lime and such other impurities requiring too great a degree of heat to precipitate, that can be supplied with exhaust steam. In these cases, the company recommends that the open heater be followed by the live steam purifier, which completes the work of purification, and supplies the boiler with water at about the same temperature as that in the boiler, and absolutely freed from scale producing impurities. This combination of open heater and live steam purifier is advised as being the most economical in results, thus saving and utilizing the heat in the exhaust steam, which otherwise would be wasted. In many instances, however, it is for various reasons impracticable to use an exhaust steam heater, and to meet such, and also the requirements previously mentioned, the horizontal live steam purifier, herewith illustrated, was expressly designed. In mode of operation it is similar to the upright live steam purifier, but its mechanical construction is quite different.

It is a horizontal cylinder, made of best steel boiler plate, and may be placed in any convenient locality above the boilers to be supplied, and with which it is directly connected.

The cold water, or water from exhaust heater, is introduced at *A* through a pipe connected by tee with a horizontal pipe inside the shell. Both ends of this horizontal pipe are perforated with many small openings, through which the water escapes in the form of a shower. Live steam is admitted at *B B*, filling the purifier with steam at boiler pressure. The water falls from the induction pipe through a body of steam into the top of two series of shallow iron pans, each pan being one-half the length of the purifier shell. These pans are provided with openings in the bottom at alternate ends, and the water is compelled to traverse their entire area in a thin sheet. As the heat and pressure in the purifier is the same as in the boilers, the water, in its passage over these pans, is subjected to the same chemical change as in ordinary boilers, and is relieved of all scale-producing impurities, which are precipitated upon the surface of these pans, from which they can be quickly and easily removed. After passing the circuit of the pans, the water drops into the large settling chamber, *D D*, in the bottom of the purifier, where the non-crystallized impurities deposit in the form of slush or mud, and are blown off at frequent intervals through the blow-off, *F*. To complete the work of purification, the water passes through the filtering chambers, *E E*, which are filled with coke or other suitable material, into the pure water chamber, then into the boiler through pipe *A*.

It is claimed that the feed water is then absolutely pure, and at substantially the same temperature as the water in the boiler, thus effectually preventing the deposit of sediment in the boilers, and the strain upon the boiler incident to the introduction of water at a low temperature.

Each end of the purifier is provided with a heavy head fastened in place with cap screws. The depositing pans slide on ways which are fastened to the shell, and can easily be removed through either end of the shell for cleaning, and any impurities which may attach to the bottom of the purifier shell can readily be raked out, as removing the head exposes the entire inner structure.

The Advantages of the Electric Light.

In the paper of Mr. R. E. Crompton, of England, read before the Society of Arts, a number of very excellent reasons are given for employing the electric light as an illuminant. Among the chief advantages, he states, are the following:

1. IT IS HEALTHIER. – It is the one form of artificial light which is not injurious to your health. It does not vitiate the air. If you light your houses by it, the rooms in which you yourselves, your children and servants, live and sleep, remain cool and sweet even if lighted continuously day and night. In your shops and factories your employés can use it continuously without feeling the lassitude, headache, and fatigue which invariably accompany the use of gas. In your theaters you no longer feel the headache and dryness of the eyes which you associate with the glare and glitter of theatrical performances. It is now an acknowledged fact, that in paying for the electric light you are paying for health at the same time, and that every hour a man spends in a room lighted by gas tends to shorten his life and abridge his powers of work. No doubt in time the public will see the advantage of spending their money on healthy light as they are now so largely doing on sanitary and other arrangements necessary to make healthy houses.

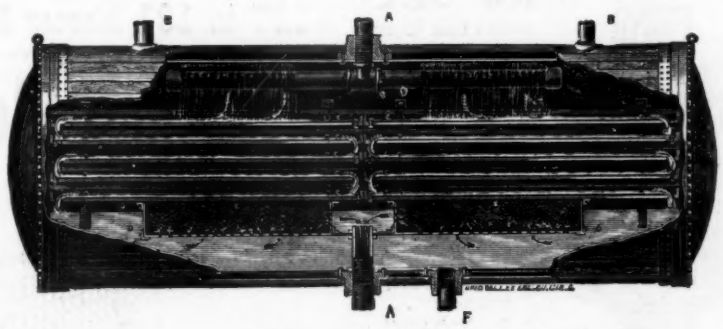
2. IT IS STEADIER AND PLEASANTER.—It does not tire or overstrain your eyes. The incandescent lamps give the steadiest light that is known. The arc lamps give the most powerful light that is known. By using one or the other, or the two combined, you can obtain a far higher degree of steady illumination than is possible with any other form of artificial light. Thus the eye is not tried or overstrained. Colors can be distinguished with almost equal facility as by sunlight, and many delicate trades requiring a good light can be carried on at night without interruption. Wintry and foggy days can be rendered bright and cheerful.

3. IT IS MUCH COOLER.—Hitherto a high degree of artificial light has been associated with heat and glare. This need be no longer the case, as visitors to exhibitions and other places electrically lighted can well judge of. There is no difficulty in maintaining a regular and even pleasant temperature in large public assemblies if electric lighting is used. The incandescent light produces only one-twentieth of the heat of an equal light by gas, and one-twenty-eighth of that by wax candles.

4. IT IS SAFER.—There is no danger in using the electric light. No explosions can occur, and as matches are not required for lighting there can be no danger from the careless handling of these dangerous things. The insurance companies have laid down a code of rules for the fixing of wires which, if adhered to, render danger from overheating of these conductors impossible; and they now undertake to insure premises where the electric light has been introduced, which previously they either refused altogether or else stipulated that no artificial illumination should be allowed on account of the danger of fire.

5. IT IS PRETTIER.—As the incandescent lamp can be fixed in any position, it lends itself admirably to decoration. It can be placed among flowers without injuring them, and on account of its absolute immunity from danger it can be fixed among delicate lacework or drapery or anywhere necessary to produce a softened artistic effect. It is impossible in the space here available to give an idea of the many beautiful and novel effects that can be produced.

6 IT IS CHEAPER.—In nearly every case where manufacturers work long hours by artificial light the electric light has proved cheaper than the rivals which it has displaced. You, the public, have it in your power, by co-operation, to obtain it at a price which will compare favorably with that of gas when the total cost of lighting—*i. e.*, for gas, oil, lamps, candles, and matches—is taken into consideration. The indirect savings from the electric light are considerable. The decorations of your rooms, your books, pictures, plate, jewelery, and stock-in-trade of your shops are not injured, whereas the reverse is the case when gas or petroleum are used.



THE STILWELL PURIFIER.

A Novel Electrical Shipment.

Recently the Ball Electric Light Company, of New York, has shipped to Quezaltenango, a city of some 25,000 inhabitants, in the State of Guatamala, C. A., a very complete electric light installation. The plant approximated in weight about 70,000 pounds, and this enormous weight is to be transported to a city 90 miles distant from either railroad or water communication. The cost of transportation will be far in excess of the cost of the plant, and the assistance of several hundred natives will be required to move the plant at the rate of 10 miles a day over mountain paths for 10 days to an elevation of 8,000 feet. Water power is to be used to drive the three dynamos, which are of four amperes and 3,500 volts. The lamps are of 800 candle-power, and each dynamo has a capacity of 70. The arc circuits will be three in number, in which will be arranged in multiples of four, 250 incandescent lights.

—— The Asphaltum Block Company is introducing electric light into its extensive works at Swedesburg, Pa. The engine to work the dynamo is already in place, and electricity will be used as the illuminant as soon as the arrangements can be completed. Both arc and incandescent lights are being put up.

—— At Elmira, N. Y., the splendid home of Col. F. C. Divinny was badly damaged by a gas explosion one evening last week. The concussion blew the roof off of the art gallery, wrecked the walls, and destroyed several valuable paintings, the total loss amounting to about $20,000. Why not use gas as a means of execution of criminals?

—— At a recent meeting the Carbondale (Pa.) council committee on gas and water refuted the gas bills referred to them. The councilmen thought that gaslight was getting to be very expensive and instructed the committee to find out what it would cost to light the rooms with the electric incandescent lamps. It was also hinted that the electric light company might furnish light for the fire department free of charge.

—— The Water Works Commissioners (Covington) filed suit against the Silver Electric Company and T. E. Livezay for $500. The plaintiffs claim that defendants placed an electric light machine in the water works that they claimed would furnish sufficient light at the works, and that in a short time the machine refused to do the necessary amount of work required of it and is a failure.—*Cincinnati Times-Star.*

ELECTRIC LIGHT NEWS

—— Ellensburg's (Washington Territory) electric light plant will be in operation by September 1.

—— There are over 1,000 incandescent electric lamps in use on board the new steamship, the "City of New York."

—— The Nightingale Bros. have just put in their silk mill at Paterson, N.J., a 600 light plant of the United States system.

—— The Allentown, Pa., Spinning Company has just put in an electric plant of 250 lights of the United States Company's system.

—— The Bessemer (Ala.) Electric and Power Company have let the contract for erecting the building for their plant to Thomas Y. Huffman.

—— The Edison and Swan United Electric Light Company, Limited, announce their intention of appealing against Mr. Justice Kay's late decision.

—— The Pike Electric Company have contracted to furnish an electric light plant of the American system to the St. Charles Car Company, St. Louis.

—— The Edison system will be used by the electric light company at Ellensburg, W. T. Power will be furnished by water in summer, and steam in winter.

—— The city of Eau Claire has accepted a proposition from the Brush Electric Company to light the city for five years at the rate of $110 per light per year.

—— The Central Trust Company, of 54 Wall street, has put in an incandescent plant of the United States Electric Lighting Company's system, using 800 lamps.

—— At Derby, Conn., the electric light was not in operation on Bank street Tuesday night, and the residents and travelers realized more than ever how indispensable it had become.

—— It is estimated that during the week ending the 11th of August, the amount of capital invested in electric lighting and new plants in the United States amounted to the sum of $685,000.

—— The United States Electric Lighting Company has just installed an arc light plant for the Bibb Manufacturing Company, at Macon, Ga., and also for the Lauer Brewing Company, at Reading, Pa.

—— At Omaha, Neb., the city clerk was authorized, by a resolution, to advertise for bids for the lighting of the city by electric light, gas or other light, said bids to be presented before September 4.

—— The Street Light Committee at Holyoke, Mass., has decided to increase the number of arc lights in the streets. One is to be placed in front of ward 7 engine house—a good place to locate an electric light.

—— The Northwestern Electric Supply and Construction Company, of Seattle, W. T., has contracted with the Northern Pacific to light Stampede tunnel. Three hundred 30 candle-power lights will be used.

—— The new electric style of hanging will possess this beauty: Stranger (to lady in mourning): "I infer, madam, that you have recently lost a husband." Widow (sadly): "Ah, yes, sir; my poor husband was struck by lightning."

—— The great number of letters that have been received by the chairman of the executive committee indicate an increase in interest in the National Electric Light Association meetings. The chairman, Dr. Otto A. Moses has been a very busy man for several weeks, answering his mail, and completing arrangements for the meeting that begins here August 29th.

ELECTRICAL PATENTS

(Copies of any Patents in the following List will be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING AUGUST 12, 1888.

387,642 387,643 Galvanic battery; Ernest M. Hewett, Boston, Mass., assignor to Hiram G. Farr, same place.

387,645 Multiple switchboard; Milo G. Kellogg, Hyde Park, Ill.

387,654 Jar for galvanic batteries; Bernard Overlack, Boston, Mass., assignor to the Overlack Elastic Composition Company, Saco, Me.

387,672 Stop mechanism for knitting machines; Matthew C. Yarwood, Fall River, Mass.

387,679 Electrolyte for galvanic batteries; Derick H. Fitch, Casenovia, N. Y.

387,703 Circuit closer for electric clocks.

387,704 Electric clock system; Charles D. Warner, Ansonia, and Arthur D. Bennett, New Haven, assignor to the Standard Electric Time Company, New Haven, Ct.

387,714 Electric motor; Bradley A. Fiske, U. S. Navy.

387,718 Telephone support; Newton W. Hartwell, Louisville, Ky.

387,732 Electric cut out; Joseph A. Powers, Lansingburg, N. Y.

387,839 Galvanic battery; Granville T. Woods, Cincinnati, Ohio.

387,842 Automatic coin controlled ticket printing weighing scale; Edward H. Amet, Chicago, Ill., assignor to himself and Herbert A. Streeter, same place.

387,853 Regulator for dynamo electric machines; Charles L. Buckingham, New York, N. Y., and Hermann Lemp, Hartford, Ct.

387,876 Process of preparing aluminum bronze and other alloys; Paul Heroult, Lauffin-Uhiviesen, Switzerland.

387,888, 387,889, 387,890 Multiple switchboard; Milo G. Kellogg, Hyde Park, Ill.

387,932 Flash light signal; William H. Thompson, Richmond, Va.

387,969 Insulation for mechanical telephone conductors; Francis E. Clark, New York, N. Y., assignor, by direct and mesne assignments, of one-fourth to Charles A. Hess and William J. Townsend, same place.

387,974 Electric clock synchronizing system; Charles J. Hexamer, Philadelphia, Pa., assignor to the Philadelphia Time Telegraph Company, same place.

388,003 Meter for alternating electric currents.

388,004 Method of measuring alternating electric currents; Oliver B. Shallenberger, Rochester, Pa.

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THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

July 25th, 1888.

The Semi-Annual Meeting of the National Electric Light Association will be held at Hotel Brunswick, New York City, August 29, 30, 31. All communications relating to this Convention to be addressed to

DR. OTTO A. MOSES,
Chairman Executive Committee,
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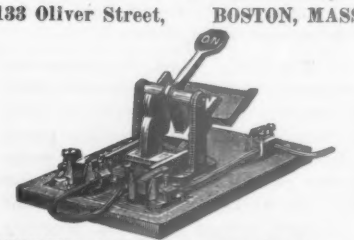

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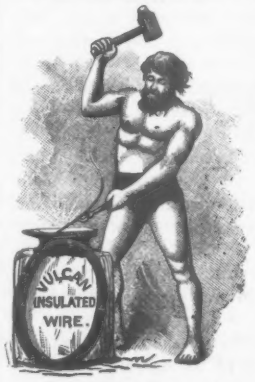

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